Editorial

Ambulatory surgery – inns and hotels

Originally in the context of ambulatory surgery, hotels or hostels associated with surgical day units provided accommodation for patients who either lived too far from the unit to return home after surgery or who did not meet the social requirements for this form of treatment, e.g. no-one to be with them at home for the first 24–48 hours postoperatively. Such units were staffed by non-medical and non-nursing personnel who, when required, would act in place of the patient's relatives. Medical and nursing services were available on the same basis as if the patient were at home.

Recently on both sides of the Atlantic this concept, for different reasons, is being lost. In the United Kingdom, patient hotels are being developed where there are a small number of nurses on duty 24 hours a day and ward rounds are undertaken by medical staff. The only difference between these units and a minimal-care ward is that they are better decorated. In the United States of America hotels or inns staffed with nurses are being built alongside ambulatory surgery centres. They provide accommodation for short stay surgery cases as well as relevant day cases operated on in the ambulatory centres.

The reason for this approach in the United Kingdom, one suspects, is due to a fear of making a firm decision about whether a patient is fit to return to a true home environment. In the United States the development is driven by a desire to increase the revenue of ambulatory centres by treating short stay inpatients as well as day cases.

Surely hotel rooms with full-time nursing services and visiting doctors are wards, and ambulatory centres are theatres and recovery rooms. If the two are combined the result is a hospital with inpatient facilities. Is there a danger with the development of these new format hotels and inns of ambulatory care slowly reverting to inpatient care?

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Review

Controlling postoperative nausea and vomiting

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Postoperative nausea and vomiting (PNV) in the ambulatory surgical unit is a continuing and vexing problem. Delayed discharges and patient discomfort have major impact in an outpatient setting. An understanding of the causes and aetiologies of PNV including anaesthetic, surgical and patient factors is critically important in the management of these patients. Therapy begins with a good history, identification of patients at risk, and the use of appropriate anaesthetic technique and agents, as well as prophylactic treatment. Aggressive postoperative treatment is also a necessity and good communication between the staff, and the patient and their family, is essential. Postoperative nausea and vomiting can be controlled in the outpatient setting, leading to better patient outcome and satisfaction, as well as a smoother and more efficiently functioning ambulatory unit.

Key words: Postoperative emesis, ambulatory surgery, anaesthesia complications, postoperative nausea/vomiting aetiology and treatment

The dramatic increase in outpatient surgery in the United States over the past 15 years, has led to the development of a new set of challenges for the anaesthesiologist. The major focus of ambulatory anaesthesia involves the delivery of a safe anaesthetic coupled with a timely discharge home. This is profoundly different from inpatient surgery where minor problems such as postoperative sedation, or nausea and vomiting, are nothing more than minor annoyances. In the ambulatory setting these problems become major concerns, because the patient is not able to go home. This dramatically affects the patient's perception of their ambulatory surgical experience as well as having an impact on the flow and efficiency of the ambulatory surgical unit.

Postoperative nausea and vomiting is a very common problem which has been around for a very long time. The first issue of *Anesthesia and Analgesia*, published in 1914, featured an article on its front cover entitled 'Prophylaxis of postanesthetic vomiting'[1]. Almost eight decades later the subject is still one of the major concerns that we face in the postanaesthesia care unit (PACU) and is a topic that is being continually studied by experts in the field.

Postoperative nausea and vomiting are the most common complications reported from ambulatory surgery centres[2] and is a primary factor associated with unexpected hospital admission after outpatient surgery[3].

Given the impact that the problem of postoperative nausea and vomiting has on ambulatory surgery patients, it is important that a thorough understanding of the aetiologic factors, and methods of control available, are understood. This article will focus first on the different causes and aetiologies of postoperative nausea and vomiting and will then discuss the options for prophylaxis and treatment.

Causes of postanaesthetic nausea and vomiting

There are, unfortunately, many predisposing factors in the aetiology of postanaesthetic nausea and vomiting (Table 1). However, an understanding of what these causative factors are will allow the anaesthesiologist to tailor the anaesthetic so as to minimize the chances of a patient having postanaesthesia nausea and vomiting. Knowing which patients and which surgical procedures are prone to postoperative nausea and vomiting will help target specific patients for prophylactic medication. Some of the factors to be discussed are controversial,

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Table 1. Factors associated with postoperative nausea and vomiting (PNV)

Anaesthetic technique
General (vs. regional) anaesthesia
Gastric distension (mask ventilation)
Anaesthetic agents
Narcotics
Nitrous oxide
Etomidate/ketamine
Thiopental (vs. propofol)
Neostigmine (vs. edrophonium)
Glycopyrrolate (vs. atropine)
Patient factors
Previous PNV
Young age
Female gender
Obesity
Menstrual phase
Motion sickness
Surgical procedure
Laparoscopy
Postoperative
Pain
Ambulation

with conflicting data in the anaesthesia literature, as will be pointed out.

Anaesthetic technique

Discussions about the choice of anaesthesia as a predisposing factor for postoperative nausea and vomiting has usually revolved around the choice of general versus regional anaesthesia. Over the past two years, however, we have seen the introduction of a major new intravenous anaesthetic, propofol, that has been shown to have significantly less nausea and vomiting than other general anaesthetic modalities. There are no studies yet available comparing propofol to regional anaesthesia, however, since neither technique is suited to all patients, having a choice is highly advantageous. We will first discuss the use of regional anaesthesia in outpatient surgery and its effects on postoperative nausea and vomiting, and then turn to a discussion of general anaesthesia.

Regional anaesthesia has frequently been advocated for ambulatory surgical patients because of improved postoperative pain control, decreased postoperative somnolence and recovery times, and lower unexpected hospital admissions[3–5]. It was also suggested that there is a lower incidence of nausea or vomiting from regional anaesthesia, when compared to general anaesthesia[6,7]. Epidural anaesthesia has recently been compared to general anaesthesia for outpatient arthroscopic surgery[8]. It was found that discharge times were shorter in the epidural group, as was the incidence of pain (24.1% *versus* 49.7%) and nausea and vomiting in the epidural group (8.9% *versus* 32%). Patient satisfaction was equally high in both groups and it was felt that epidural anaesthesia was a viable alternative to general anaesthesia for outpatient arthroscopic knee surgery, offering the advantages of fewer side effects and earlier discharge times.

Regional anaesthesia, however, is not always practical in busy ambulatory surgical facilities and clearly cannot be used for all types of surgical procedures. To be successful, there are a number of factors which can be very helpful, including the availability of a holding area where blocks can be placed in advance, so there are no delays in waiting for the block to set. Furthermore, support of the surgical and nursing staff in the facility is important, as is good communication with the patient, since many patients have preconceived fears regarding certain regional techniques such as spinal anaesthesia[9].

General anaesthesia

A discussion of factors predisposing to postoperative nausea and vomiting under general anaesthesia is a complex topic, because of the multiple agents that are commonly used nowadays in a typical 'balanced' anaesthetic. There are however a number of different studies addressing the specific agents that are commonly used during general anaesthesia, and we will discuss these in turn.

Narcotics

The use of a narcotic-based technique for the induction or maintenance of anaesthesia has definitely been shown to increase the incidence of postoperative nausea and vomiting. Numerous studies have compared fentanyl or alfentanil with the potent inhaled anaesthetics and have shown a significantly increased incidence of postoperative nausea and vomiting with the narcotic techniques[10–12]. A comparison of fentanyl with isoflurane for outpatient laparoscopy, in which patients were randomly assigned to receive either isoflurane with nitrous oxide or fentanyl 300 μg with nitrous oxide following induction with thiopental was done by Rising et al.[11]. They found a significantly higher incidence of nausea (60%) and vomiting (28%) in the fentanyl patients compared with the isoflurane patients (16% and 12%, respectively). A significantly greater number of patients in the fentanyl group (48%) required treatment with anti-emetic drugs postoperatively when compared to the isoflurane group (16%). In a comparison of enflurane, isoflurane, and a fentanyl infusion, Melnick et al.[12] showed a significantly greater incidence of nausea and vomiting (24%) in the fentanyl group than the enflurane or isoflurane groups (4%).

The studies showing an increased incidence of postoperative nausea and vomiting in narcotic-based techniques, involve cases which are heavily weighted towards narcotics, or predominantly narcotic based. This does not preclude the judicious use of narcotics to control postoperative pain. In fact, small amounts of intravenous opioid analgesics in the outpatient setting have been well documented to be highly efficacious, without increasing the incidence of side effects. Pandit and Kothary[13] studied the use of potent intravenous opioid analgesics as premedicants and found they were able to decrease patient anxiety, reduce anaesthetic requirements, and provide pain relief early in the postoperative period. They used fentanyl (1–2 μg kg^{-1}), sufentanil

(0.1–0.25 μg kg^{-1}), and alfentanil (7.5–15.0 μg kg^{-1}), and found neither prolongation of recovery time nor increased postoperative side effects. Similarly, Hunt et al.[14] premedicated a group of outpatients scheduled for a dilatation and curettage with intravenous fentanyl in doses ranging from 75–125 μg. They found a significantly reduced incidence of abdominal pain in the postoperative period and during the first evening at home, without any increase in the incidence of nausea and vomiting.

Given the data suggesting that postoperative pain has been associated with postoperative nausea and vomiting, at least in certain types of surgery, it seems prudent to use judicious amounts of potent intravenous opioids as a supplement to general and even regional anaesthesia.

There are no consistent data available to suggest among morphine or any of its newer derivatives, (fentanyl, alfentanil, and sufentanil) that there are any significant differences in the incidences of nausea and vomiting[15,16]. Certain patients, however, may be more susceptible to one specific narcotic than another, and it is prudent to change narcotics if a patient has a history of nausea and vomiting with any particular agent[17]. Among the combination agonist and antagonist drugs including butorphanol, nalbuphine, and dezocine there are conflicting reports in the literature, showing variable incidences of postoperative nausea and vomiting[18–21]. The use of the new nonsteroidal and anti-inflammatory agent, ketorolac, a potent non-narcotic analgesic, has been shown to be as effective as narcotics for postoperative pain control following ambulatory surgery[22], with a lower incidence of postoperative nausea and vomiting when compared to morphine and dezocine[23].

Nitrous oxide

Nitrous oxide has classically been implicated as being a major cause of postoperative nausea and vomiting, although this has been quite controversial[24–28]. There have been several mechanisms postulated to explain why nitrous oxide causes postoperative emetic symptoms. Nitrous oxide diffuses into the gastrointestinal tract more quickly than nitrogen can diffuse out, which may result in bowel distension and subsequent nausea and vomiting[29]. Similarly, nitrous oxide may diffuse into the middle ear, causing increased pressure[30] with stimulation of the vestibular system leading to a 'motion sickness' type of nausea and vomiting. Lastly it may interact centrally with the endogenous opioid receptor system[31,32] which can stimulate nausea and vomiting centrally.

With numerous conflicting studies involving numerous different procedures and anaesthetic techniques and the multifactorial aetiology of postoperative nausea and vomiting, it is impossible to make a definitive statement regarding nitrous oxide. Despite this controversy, however, nitrous oxide with its acceptable odour and rapid induction and emergence, is an important agent in the outpatient anaesthesiologist's armamentarium, and continues to be the main adjunctive drug for both inhalational and intravenous anaesthesia in the ambulatory setting.

It should be noted that among the different inhalational agents themselves, there is no data suggesting any difference in the incidence of postoperative nausea and vomiting. In fact even the new less soluble inhaled agents desflurane and sevoflurane have not demonstrated any significant differences regarding postoperative emesis[33,34].

Induction agents

Among the current most commonly utilized induction agents, etomidate[35] and ketamine have been found to have significantly higher incidences of postoperative nausea and vomiting. Etomidate has been utilized most often in patients with limited cardiac reserves, and is appropriate for this patient population, who if stable, may be undergoing minor outpatient procedures. However, these patients should then be targeted for prophylaxis of postoperative nausea and vomiting. Ketamine has similarly been found to have a higher incidence of postoperative nausea and vomiting when compared to the barbiturates[36] and these patients should also be targeted for prophylaxis.

Propofol

While the barbiturates have been shown to have lower incidences of postoperative nausea and vomiting when compared to etomidate and ketamine, they do have a significantly higher incidence of postoperative nausea and vomiting in comparison to the new intravenous induction agent propofol. Propofol is chemically unrelated to the barbiturates and is a milky white substance from the alkyl-phenol family. It is formulated as an emulsion in an intralipid-type substance that has only rarely been reported to cause allergic reactions[37]. Due to its extensive redistribution and rapid elimination it has become particularly well suited for outpatient anaesthesia. Numerous studies have compared propofol to other intravenous anaesthetic induction agents, as well as to other maintenance techniques. The results have consistently shown that propofol has a lower incidence of postoperative nausea and vomiting both in paediatric outpatients[38,39] and adults[40–42]. In some part, because of its low incidence of postoperative nausea and vomiting, propofol has been shown to have significantly more rapid recovery and shorter discharge times, as well as having patients experiencing a sense of well being after their anaesthetic, in comparison to thiopental[40,43]. A recent comparison of total intravenous anaesthesia with propofol and alfentanil versus propofol induction and maintenance with nitrous oxide and enflurane, found significantly lower incidences of nausea, retching and vomiting in the total intravenous group[44]. They also found that requirements for anti-emetic therapy postoperatively were lower in the total intravenous group as well as a significantly lower incidence of unplanned admissions for overnight stay in the hospital postoperatively.

The lower incidences of postoperative nausea and vomiting seen in these numerous studies with propofol has led to questions of whether propofol actually has anti-emetic properties, or was simply not as pro-emetic

as other anaesthetic agents. Scher and colleagues[45] looked at propofol for the prevention of chemotherapy-induced nausea and vomiting in oncology patients. They found that the use of low dose continuous propofol infusions, utilizing a bolus of 0.1 mg kg^{-1} followed by a continuous infusion of 1 mg kg^{-1} h^{-1}, was effective in both prevention and treatment of nausea and vomiting. Similarly, in the anaesthesia literature Borgeat et al. studied the use of propofol in the postoperative setting. They randomized patients to receive either 10 mg propofol or intralipid placebo, and found that patients treated with propofol experienced a significantly greater reduction in nausea and vomiting postoperatively (81% *versus* 35% success rate), and concluded that propofol had significant direct anti-emetic properties[46].

Neuromuscular blocking agents

The use of muscle relaxants in outpatient surgery varies depending on the type of surgical procedure, the type of anaesthesia, the length of the procedure and the inclinations of the anaesthesiologist. There is no data to suggest that there are any differences among the muscle relaxants in regards to their propensity to cause postoperative nausea and vomiting. However the use of acetylcholinesterase blocking drugs as reversal agents has been shown to increase the incidence of nausea and vomiting, because of the muscarinic effects of these agents which can increase gastrointestinal motility. King et al.[47] studied patients undergoing elective hip or knee surgery and randomly allocated patients to receive either neostigmine and atropine, or placebo. They found a significantly higher incidence of vomiting in the group that received neostigmine in comparison to the group that did not (47% *versus* 11%).

A more recent study[48] compared reversal of atracurium with either edrophonium and atropine, neostigmine and atropine, pyridostigmine and atropine or no reversal therapy, and found significantly more postanaesthesia nausea and vomiting with the neostigmine group. Another study[49] compared the use of glycopyrrolate to atropine when used with neostigmine reversal. They found a significantly higher incidence of nausea (28%) in the patients receiving glycopyrrolate as opposed to those receiving atropine (8%). They speculated that the inability of glycopyrrolate to cross the blood-brain barrier, because of its quaternary nitrogen structure, prevents inhibition of vagal tone centrally which may be a contributing factor in the genesis of nausea and vomiting. The implication of vagal tone as a factor in postoperative nausea is suggested by the effectiveness of scopolamine in preventing postoperative nausea, which presumably blocks increased vagal tone often experienced in the perioperative period. Based on the above data it seems prudent to utilize reversal agents only when necessary, and the available literature, though sparse, does suggest that the use of edrophonium and atropine may be preferable to the use of neostigmine and glycopyrrolate, at least in regards to the incidence of postoperative nausea and vomiting.

Patient factors

There are a number of predisposing factors specific to patients that have been associated with increased incidences of postoperative nausea and vomiting. These include young age and female gender. Women have been shown to be two to four times more likely to experience postoperative nausea and vomiting than men[29]. Recently investigators have found that the incidence of postoperative nausea and vomiting in women is increased if the procedure is performed during the menses[50,51].

Obesity has also been implicated as a causative factor in postoperative nausea and vomiting because of increased sequestration of drugs in fat compartments, slower metabolism, and prolonged release of anaesthetics. However, recent studies have shown that body mass index is not associated with increased postoperative nausea and vomiting, when ventilation by mask is avoided prior to the induction of anaesthesia[24]. It is hypothesized that by eliminating positive pressure ventilation by face mask, one decreases the likelihood of gastrointestinal distention from forced gas, which would be more likely to happen in obese patients who are generally more difficult to ventilate.

It has also become clear that patients with a preoperative history of nausea and vomiting from previous surgical procedures, or patients with a history of motion sickness, have increased incidences of postoperative nausea and vomiting. This can be an important factor in patients travelling home after their procedure as is the norm in ambulatory patients. These patients may be very likely to experience postoperative nausea and vomiting after they leave the facility, even if they did not have any symptoms in recovery. It is important to identify these patients beforehand so that they can be targeted for prophylaxis.

Type of surgical procedure

The incidence of postoperative nausea and vomiting is influenced by the type of surgical procedure when performed under general anaesthesia. In the paediatric population, it has been shown that strabismus and orchidopexy surgery is associated with a significantly higher incidence of postoperative nausea and vomiting. Caldamone and Rabinowitz[52] found that up to 5% of their patients undergoing outpatient orchidopexy needed to be admitted to the hospital for either nausea, vomiting, drowsiness or more extensive surgery. They found that a 4–6 hour recovery room stay was the rule rather than the exception. In the paediatric population, tonsillectomies and adenoidectomies as well as middle ear surgery and otoplasty, have also been shown to have a higher incidence of postoperative emesis[53]. In the adult population, increased frequencies of postoperative emesis have also been reported in patients undergoing otologic procedures as well as ophthalmic and gastrointestinal procedures[54,55]. Recently Pataky et al.[56] found that laparoscopic surgery, such as laparoscopic ovum retrieval, had the highest incidences of postoperative nausea and vomiting in an ambulatory surgical setting. They also

found that the length of stay in the PACU was 50% greater in patients who had postoperative nausea and vomiting. They suggested that administrators establish ideal scheduling principles in which patients scheduled for procedures with higher incidences for emesis be scheduled early in the day, and that a separate step down recovery unit would be desirable to have for these patients so that their presence would not disrupt the function or capacity of the ambulatory unit.

Postoperative factors

Pain has frequently been quoted as a major reason for postoperative nausea and vomiting. Andersen and Krohg[57] are the source of this widely quoted aetiology, and this would seem to be supported by the increased incidence of emesis following naloxone antagonism of narcotic mediated pain relief[58]. However, their study only examined inpatients undergoing abdominal surgery, which may not be applicable to other surgical procedures in ambulatory settings. Recently, in a study looking at ambulatory arthroscopic knee surgery[59] a relationship between pain and nausea and vomiting could not be established. It is likely that the degree of pain, the site, and the type of pain, i.e. visceral or peripheral, all contribute towards the likelihood of producing postoperative nausea and vomiting.

Ambulation postanaesthesia is a frequent cause of postoperative nausea and vomiting, and may be due to postural hypotension in the postoperative period, either from residual vasodilatation from anaesthetic drugs, or residual sympathectomy after regional anaesthesia. Sudden movement may also stimulate the vestibular system which can be sensitized by the prior use of opioids. These postoperative factors are probably the reason for the success of ephedrine in preventing postoperative nausea and vomiting by reversing postural hypotension and residual vasodilatation[60].

Prophylaxis and treatment of postoperative nausea and vomiting

It is ideal that the problem of postoperative nausea and vomiting be managed with a prophylactic approach, particularly in those patients identified to be at risk. It is not necessary that all outpatients be prophylaxed because many of the agents have side effects. However, small doses given prophylactically may reduce the overall discomfort and inconvenience experienced by ambulatory patients. Outpatients, often less sedated than their inpatient counterparts are eagerly waiting to go home, making them more likely to be upset by postoperative nausea and vomiting.

Unfortunately, preventive therapy will not be able to eliminate totally the incidence of postoperative nausea and vomiting, and timely intervention is therefore very important. The anaesthesiologist should write for postoperative anti-emetics when the patient is brought to the PACU, or standing orders should be available for the PACU nurses. This will avoid delays that are so common in trying to reach the anaesthesiologist or surgeon to give specific orders each time. Preprinted order forms with strict guidelines will allow prompt treatment of postoperative nausea and vomiting.

Table 2. Agents utilized for postoperative nausea and vomiting

Benzquinamide (Emete-Con)
Hydroxyzine (Vistaril)
Prochlorperazine (Compazine)
Trimethobenzamide (Tigan)
Transderm scopolamine
Diphenhydramine (Dramamine)
Droperidol (Inapside)
Metoclopramide (Reglan)
Ephedrine
Ondansetron (Zofram)

Specific agents

Over the years there have been numerous agents utilized for the control of postoperative nausea and vomiting in the PACU (Table 2). Many of these agents are of historical value only and have found limited efficacy in the postoperative setting. A major problem with these agents is over-sedation which is an exceedingly important consideration in the ambulatory setting.

The two agents most commonly used by anaesthesiologists for postoperative nausea and vomiting are droperidol and metoclopramide. Droperidol is a highly effective anti-emetic agent when given in a low dose intravenously and does not appear to affect discharge times significantly[61]. Dosage guidelines for low dose intravenous droperidol range from 0.625 mg to 0.125 mg for the average adult. In the paediatric population, 20 μg kg^{-1} i.v. of droperidol has also been found to be efficacious[62]. Droperidol is a long acting medication and can be given prophylactically at the beginning of the case or it can be used to treat emetic symptoms postoperatively. Droperidol in higher doses has been reported to cause sedation and can also potentiate other central nervous system depressants that are given either intraoperatively or postoperatively. Droperidol is also an α blocker which may cause vasodilatation and postoperative hypotension. It should be used cautiously in patients who are hypovolaemic, dizzy upon standing or who have low blood pressure. Rarely, droperidol may also cause an acute dysphoric reaction as well as extra-pyramidal symptoms such as dystonia or oculogyric crisis. Should this occur, the treatment is benztropine (Cogentin 1–2 mg), or diphenhydramine (Benadryl 25–50 mg). Recently, Melnick et al.[63] reported delayed side effects from droperidol after general anaesthesia for minor outpatient procedures. They found that patients given droperidol reported anxiety or restlessness significantly more often than patients who did not receive droperidol. They suggested that the routine prophylactic use of droperidol in all outpatients may not be appropriate, and should probably be reserved for those patients at high risk. This is, however, an isolated report that has not been resubstantiated.

Metoclopramide has central anti-dopaminergic effects similar to droperidol, however, it is the only anti-emetic that also specifically acts on the upper gastrointestinal tract. Metoclopramide is a gastro-prokinetic drug, which sensitizes the upper gastrointestinal tissues to the action of acetylcholine, thereby stimulating gastric motility. Metoclopramide also increases the resting tone of the lower oesophageal sphincter, relaxes the pyloric sphincter and duodenal bulb during gastric contractions, and simultaneously increases peristalsis of the proximal small bowel. The net result is an accelerated gastric emptying time and small bowel transfer time. This medication therefore has applications in the preanaesthetic period to help eliminate gastric contents and prevent aspiration, while also helping to decrease the incidence of nausea and vomiting. Prior treatment with anticholinergic drugs do not inhibit the gastric prokinetic actions of metoclopramide in normal patients as it does in obese patients, though the reasons for this difference are not clear[64,65].

Because metoclopramide is a relatively short-acting medication with a duration of about 2 hours, it may need to be repeated at the end of a long procedure or in the PACU. The usual doses of metoclopramide are 10–20 mg 70 kg^{-1} for the average adult patient. Much higher doses are utilized for prevention and treatment of chemotherapy induced nausea and vomiting, with doses up to 1 mg kg^{-1}. The use of lower doses in the postoperative setting may explain why some studies have not found significant anti-emetic effects from metoclopramide in outpatient settings[66,67]. Metoclopramide is much less likely to cause side effects or extra-pyramidal symptoms, though these have been reported[68] and are more likely to occur at higher doses. Should extra-pyramidal symptoms occur the treatment would be similar to droperidol (i.e. benztropine or diphenhydramine). It must be remembered that metoclopramide, with its gastro-prokinetic action, is contraindicated in patients with bowel obstruction or partial bowel obstructions, and both droperidol and metoclopramide are contraindicated in patients with Parkinson's disease, because of their central anti-dopaminergic activity.

While droperidol and metoclopramide therapy have been found to be useful in the postoperative ambulatory surgical setting, they are not always completely effective nor do they always prevent postoperative nausea and vomiting. Combination therapy has been suggested as a method of increasing the amount of anti-emetic drug given without a concomitant increase in the incidence of sedation or side effects. Doze et al.[69] compared droperidol to the combination of droperidol and metoclopramide and found that the combination was more effective in preventing nausea and vomiting than droperidol alone.

Other investigators have approached the problem of postoperative nausea and vomiting from the perspective of motion sickness. It has been well documented that a history of motion sickness is a strong predictive factor in postoperative nausea and vomiting. Dimenhydrinate (Dramamine) is a commonly used anti-motion sickness drug that has been found to decrease the incidence of postoperative nausea significantly, in comparison to droperidol (8% *versus* 21%) and placebo (8% *versus* 34%)[70]. Dimenhydrinate is an antihistamine and its anti-motion sickness effect is thought to be due to a combination of its primary H^1-blocking effect and central anti-cholinergic action.

Ephedrine has also been studied for the prevention of postoperative nausea and vomiting in outpatients. Rothenberg et al.[70] found ephedrine (0.5 mg kg^{-1} i.m.) to be as effective as droperidol (0.04 mg kg^{-1} i.m.) in reducing the incidence of nausea and late vomiting, with significantly less postoperative sedation in the ephedrine group. Ephedrine has been found effective in the prevention of motion sickness in astronauts[71], and is commonly used to treat nausea and vomiting following hypotension after spinal and epidural anaesthesia, where it reverses the hypotension from the induced sympathectomy. The mechanism for ephedrine in the prophylaxis of motion sickness is postulated to be the altering of unusual vestibular inputs, and applicable to other classes of sympathomimetics and parasympatholytic agents. After a general anaesthetic, patients are frequently volume depleted or may have residual vasodilatation from inhalational anaesthetic agents, which may cause nausea and vomiting when patients are sat upright or try to ambulate. This of course would be reversed by ephedrine, which may explain some of its efficacy for postoperative nausea and vomiting.

Ondansetron

A new medication that has recently been introduced into anaesthesia practice for controlling postoperative emesis is ondansetron. This is a new class of anti-emetic that has been utilized for chemotherapy-induced nausea and vomiting for a number of years. It is a serotonin receptor ($5\text{-}HT_3$) antagonist, which has both central and peripheral mechanisms of action. Ondansetron (Zofram) was found to be highly effective compared to placebo in the postoperative setting when used in a dose of 8 mg intravenously[72]. Leeser and Lip[73] studied the prophylactic effect of ondansetron for postoperative nausea and vomiting utilizing a 16 mg oral dose and found a significantly decreased incidence of nausea and vomiting (17% and 12%) *versus* the placebo group (52% and 40%). They repeated their dose 8 hours after the initial dose and found similar differences throughout the entire 24 hour study period after recovery. Unfortunately, the drug is currently expensive, though if it prevents an unduly long recovery stay or an unanticipated hospital admission it would be well worth the cost.

Nonpharmacologic approaches

A new nonpharmacologic approach to the control of postoperative nausea and vomiting is acupressure and/or acupuncture[74]. Dundee et al. studied women undergoing minor gynaecologic operations with manual and electrical acupuncture and found a markedly reduced incidence of postoperative nausea and vomiting in the first 6

hours after surgery compared with untreated controls. They also found that noninvasive stimulation via a conducting stud or pressure, were equally as effective as invasive acupuncture during the early postoperative period, though less effective than invasive acupuncture. In patients undergoing chemotherapy they found that the duration of action could be prolonged by application of pressure every 2 hours to the acupuncture point with a duration up to 24 hours[75]. A commercially available product called Sea-Band (Travel Accessories, Solen, Ohio), is available for travellers and consists of an elastic band with a bead stud that rests over the P6 (Neiguan) acupuncture point, and has been reported to be efficacious for postoperative vomiting[76]. In the paediatric population, however[77], investigators were not able to find any significant anti-emetic effect from the acupressure point in ambulatory strabismus surgery patients. Further investigations for the role of this modality are needed.

Conclusions

Persistent postoperative nausea and vomiting in the PACU may require repeated doses of anti-emetics and may also require that more than one type of anti-emetic be utilized. Standing orders should be available for prompt and rapid institution of such therapy and careful attention must be given to pain control and the patient's volume status. It should be remembered that intravenous fluids should be increased to account for fluid losses and should be maintained until all fluids are tolerated.

It is important that there is good communication between the anaesthesiologist, the patient and the patient's family. The patient should be warned prior to the procedure, during the preoperative interview, that nausea and vomiting are common side effects of anaesthesia and surgery. If warned in advance, patients will be much more receptive should postoperative emesis become a problem, and will be better able to handle it from a psychological point of view. Although rare, there will be the occasional patient for whom postoperative nausea and vomiting will be refractory to all efforts to control it. Patients with persistent nausea and vomiting should be treated with maximal doses of anti-emetics, notwithstanding the fact that postoperative sedation may be increased. It is preferable to admit a patient for oversedation with controlled nausea and vomiting, than unsedated with uncontrolled nausea and vomiting.

In summary, it appears clear that postoperative nausea and vomiting continues to remain an important and clinically significant problem in the ambulatory surgery setting. An understanding of the factors that predispose patients to postoperative nausea and vomiting can help target patients who are high risk, as well as help the anaesthesiologist tailor an anaesthetic to minimize postoperative nausea and vomiting. The use of regional anaesthesia or general anaesthesia with propofol seems to be associated with lower incidences of postoperative nausea and vomiting. Small doses of multiple anti-emetic agents as well as the use of newer agents such as ondansetron hold promise for improved control of postoperative nausea and vomiting. Recognition of the problem, and prompt treatment in the PACU, ideally with the use of standing orders, is imperative. The problem of postanaesthetic nausea and vomiting requires a cooperative effort among the anaesthesiologist, the PACU nurse, and the patient, all working toward the goal of decreasing or preventing patient morbidity and improving patient safety, comfort and recovery.

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Review

Discharging patients: innovative postoperative care

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After surgery, the optimal goal is when the patient recovers without complications related to surgery or anaesthesia and can be discharged to home. However, that sometimes is an elusive goal. Several trends affect the ambulatory surgery population and discharge plans: today's generally older and sicker patients and more complex procedures along with economic pressure from insurers to perform procedures inexpensively. Many patients who are elderly, socially isolated, or systemically sick are forced into same day discharge after surgery whether they are ideal candidates or not. Most often the patient's home is the ideal setting for recuperation after surgery, but alternatives exist. These include home health nursing care with or without infusion therapy, 23 hour admission units, medical hotels, recovery care centres, surgical speciality hospitals, and traditional hospitalization. Each has its benefits and drawbacks, but provides a certain level of care and safety for patients after ambulatory surgical procedures.

Key words: Ambulatory surgery, discharge, recovery

Discharging patients on the same day after surgery and anaesthesia is an important responsibility. Healthcare providers must be cautious, thorough, and committed in their predischarge assessments when determining the appropriateness of each patient's physical, emotional, and social status. Is the patient physically able to return home? Are surgical or anaesthetic complications either present or likely to occur in the home recovery period? Does the adult who will be responsible for the patient display ability and desire to provide the level of attention that this patient will require? And what is the patient's attitude and desire about discharge? The patient who is motivated and eager to return home is likely to do well despite minor problems such as continuing nausea or discomfort. Whether the procedure is simple or complex, the process of same day discharge places stress and responsibilities on patients and their families.

Assuring that the patient is in the best possible condition for discharge is not only appropriate; it is essential. That process actually begins long before the time of discharge with the physician's careful selection and the proper preparation of patients for outpatient surgery. Obviously, the optimal situation occurs when the patient receives comprehensive and cautious care and recovers without complications related to surgery or anaesthesia. With careful application of the facility's discharge criteria, most patients are able to return home soon after surgery.

Current social and economic trends significantly affect the ambulatory surgery population, particularly in regards to discharge plans. With today's many medical advances that effectively prolong people's lives, the population is growing older and we see that trend reflected in the ambulatory surgery population. These older people are more likely to have co-morbid conditions such as heart disease, diabetes melitus, respiratory aliments, and other problems that can negatively affect the period of recuperation. Societal mobility leaves many families separated by great distances, without the close support of loved ones. In addition, third party payers are placing relentless requirements on providers to complete procedures in the most cost-effective manner, and that is often on an outpatient basis. This economic pressure is often at odds with the medical ideal, and many patients who are elderly, socially isolated, marginally competent, or systemically sick are forced into same day discharge after surgery whether they are ideal candidates or not. When dealing with insurers, it is becoming increasingly difficult for physicians to justify hospitalization for surgical patients.

Another trend finds more complex procedures being performed on an outpatient basis, ranging from simple mastectomy and partial thyroidectomy to extensive operative laparoscopic procedures such as cholecystectomy and laparoscopically assisted vaginal hysterectomy (LAVH). Even after these more complex procedures,

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patients who have not suffered complications may still be discharged to their own homes after surgery in well-controlled situations, for instance, if a family member is capable of the level of care required or if outside professional nursing care can be obtained.

As the healthcare community has become more experienced with these advanced types of procedures, a level of comfort has developed about the acceptability of performing them on an outpatient basis. Less stringent aftercare requirements are now understood to be safe and acceptable. This shift in ideology is logical and merely one more evolutionary change in the outpatient surgery continuum. Remember, it was only a few years ago that laparoscopic cholecystectomy coupled with early discharge was considered revolutionary and, in many circles, foolish! Today its safety and its benefits to patients and to society are well documented.

These and other issues must be considered when discharge after outpatient surgery is contemplated. First, the facility's written discharge criteria must meet the test of safety, appropriateness, and concordance with accrediting and licensing agencies. Second, an appropriate post-discharge setting must be assured. Often that site is the home, but sometimes it is an alternative. Ambulatory surgery programs have spawned many approaches to safe, cost-effective care after discharged. First, we should look at the criteria by which patients are discharged.

Disharge standards

Facility, licensing, and accrediting bodies establish standards within which ambulatory surgery programmes must operate. Some of these standards address the discharge of patients. Facility regulatory standards may differ from one location to another, but federal and accrediting standards are more universal. Payment of federal funds to a facility for care provided for Medicare patients is contingent on following the established guidelines of the Health Care Finance Administration (HCFA) whose generic quality screens for ambulatory surgery patients include the requirement for a documented discharge plan including patient education and provisions for follow-up care[1]. Appropriateness of care related to this element of the generic quality screens requires a physician evaluation for proper anaesthesia recovery prior to patient discharge, unless only topical or local anaesthesia has been used for the procedure.

Accrediting organizations also address discharge issues. Since 1988, the Standards of the Joint Commission of Accreditation of Healthcare Organizations (JCAHO) have allowed predetermined, "relevant discharge criteria to be rigorously applied to determine the readiness of the patient for discharge." These criteria must have been previously approved by the physician staff[2]. This approach allows the nurse to act on behalf of the physician in determining the patient readiness for discharge when the physician is not immediately available, thus expediting the patient's discharge. While nurses certainly must assume professional responsibility and accountability for their actions, the ultimate responsibility for patient discharge remains with the physician through the prior approval of acceptable discharge criteria. Patients not meeting predetermined criteria require a specific physician's order prior to discharge by the nursing staff.

The Accreditation Association of Ambulatory Health Care (AAAHC) continues to require direct physician evaluation "after recovery from anesthesia, prior to discharge"[3] precluding primary nursing discharge. This scenario is cumbersome, and its current application has been questioned as outdated throughout the country by nurses who apply predetermined criteria[4].

Discharge criteria

Many well-established parameters are universally accepted as appropriate for determining discharge readiness. Examples include stability of vital signs, lack of respiratory distress, return of protective reflexes, relative comfort, no excessive surgical bleeding, availability of safe transportation and an adult companion, and return of sufficent cognitive and motor abilities. Also before discharge the patient and responsible adult must receive clear instructions for self care at home along with information on when, how and for what reasons to contact the physician for emergency care or questions.

Less universal are standards relating to the ability to void or to tolerate oral fluids before discharge and the acceptable level of nausea or vomiting continuing postoperatively[5]. The necessity of stringently meeting each of these parameters before discharge is a matter of clinical judgment and practices that varies from one facility or physician to another. Their application is also dependent on other factors such as the patient's prior state of health and hydration, age and the type of procedure performed.

The requirement for adult companionship after discharge is another area of concern that has been interpreted and applied in varied ways. Common sense as well as criteria determined by outside agencies and healthcare facilities identifies adult companionship for support and monitoring as a prerequisite to discharge. Questions certainly arise here. Who judges the acceptability of the responsible adult? What control, if any, does the physician or nurse have over the patient's plans for companionship after the actual discharge? Should a patient be allowed to leave the facility when it is known that there will be no continued supervision in the home once the transporter has dropped the patient off? Where do liability and responsibility lie when an unacceptable home situation is known (or not known) prior to surgery? Is the patient denied surgery because he is an elderly man living alone with no relatives or neighbours who he can ask to watch over him? These are difficult questions made even more difficult by a healthcare system that often will not or cannot pay for extended postoperative care for such individuals.

To address these dilemmas, each facility should create a multidisciplinary body to develop policies and criteria that will provide direction for the staff when dealing with such problems. Still, every situation is unique, so the

Table 1. Post-discharge care alternatives

Home (or alternative site) under care of responsible adult
Home (or alternative site) with nursing care
Home (or alternative site) with nursing care and infusion therapy
Twenty-three hour admission units
Medical hotels
Recovery care centers
Surgical specialty hospitals
Hospitalization

availability and willingness of adminstrative personnel, physicians, and the medical director of the unit to help solve individual situations is essential. When patients are identified who would benefit from further care after the usual time of discharge, it is clearly in the best interest of the patient and the facility for the healthcare providers to initiate such plans.

Post-discharge care alternatives

Innovative practices fuelled by patient needs have led to the development of both traditional and new approaches to surgical aftercare as listed in Table 1. The type of ambulatory surgical facility (hospital or freestanding), the patient's health insurance, state licensing mandates and legislation, the attitudes and progressiveness of the community's healthcare professionals, and the availability of community resources all play a part in the development and success of innovative post-discharge programs.

It can be challenging to convince an insurer to approve a nontraditional approach to post-discharge care, although a plan that is both safe and cost-effective may be attractive, particularly if that plan will eliminate a costly bill for hospitalization. Amazingly, some insurers continue to disapprove such innovations even when they will have to finance a more costly hospitalization by doing so. One reason given by payers is concern about the potential cost-shifting impact of removing elective surgical patients from hospitals. Another is concern over licensure status for overnight patients. As the speciality of ambulatory surgery evolves, more and more state legislatures are being challenged to open the service of post-surgical overnight care historically dominated by hospitals to allow development of innovative alternatives to hospitalization. The following discussion of various post-discharge programs assumes the availability of resources and the insurer's approval or the patient's ability to finance the care.

Care in the home setting

Discharge to home under the care of a responsible adult is clearly the simplest and most common form of outpatient discharge, but sometimes more intensive needs occur that can be met through visits from a home health nurse. This action may be taken because of the patient's lack of home support, extensive pre-existing physical ailments, or surgical complexity or complications. Plans for home health nurses should be made prior to the day of surgery to increase the likelihood of having a nurse available and assigned. The physician's or nurse's preoperative patient assessment may well uncover reasons for establishing this service. Collaboration between the home health agency, the surgical facility's nursing staff, the surgeon, and the anaesthesia team is essential for continuity and provision of appropriate aftercare. In particular, the home health nurse assigned to the patient should have prior experience with and a comfort level in caring for surgical patients and should be provided with a comprehensive report.

Some innovative surgery centres have developed packages that include providing postoperative home health care under the blanket of one payment for the insurer. Prior to becoming TOPS Surgical Speciality Hospital, then Texas Outpatient SurgiCare negotiated with home health and ambulance agencies for nursing care and transfer needs and supplied needed medications or surgical supplies for home use from the surgery centre. This approach allowed TOPS to develop a one cost quotation that was attractive to the insurer and provided patients with appropriate care following complex procedures[6].

Registered nurses in home health care provide general nursing assessment, care, and patient education; wound or drainage tubing care; dressing changes; monitoring of physical parameters such as blood pressure, temperature, or blood glucose levels; and medication adminstration. For patients who require only companionship and help with meals and hygiene a nurse's aid or house companion may be an acceptable and more cost-effective idea.

Infusion therapy in the home may be necessary after more complex surgeries. In fact, recent innovations in home infusion therapies have been a positive factor in encouraging more advanced procedures to be performed and still allow early patient discharge. Infusion therapy may be a service of the home health nursing agency or of a separate company, depending on licensing and state mandates. Therapies typically applicable after outpatient surgery include maintenance of intravenous fluids for hydration, administration of intravenous antibiotics, and maintenance of intravenous or subcutaneous patient controlled analgesia (PCA). Technological advances have produced miniaturized pumps and tamper-proof cassettes for PCA devices and basically foolproof infusion devices for antibiotics that allow patients to remain ambulatory. The registered nurse responsible for the infusion therapy monitors the equipment, the fluids and medications, the patient response to medications, and the venipuncture site.

First dosing of antibiotics is usually not an issue since the surgical patient receiving antibiotics will most likely be continuing those already given during and/or after surgery. Still, many home infusion agencies are prepared to give first doses of drugs when the physician orders the drug and approves the use of an emergency anaphylaxis kit that the infusion company supplies for the home.

As patients and society become more informed and sophisticated, many patients and families are expected to assume duties previously held by professionals. Exam-

ples include the use of continuous passive motion devices, dressing changes, foley catheter care and removal, and intramuscular injections. Whether this is a forward or a backward step is yet to be judged, but many patients and families do very well providing self care and, in fact, have the added benefit of reducing the patient's exposure to hospital acquired infection and other nosocomial occurrences such as medication errors.

In many facilities, practice and experience have resulted in a progression, or, better named, a positive 'regression', of home nursing care levels deemed necessary. Such practice changes are exemplified by the care patterns for patients having anterior cruciate ligament repair in several freestanding centres. At the Lakewood Surgical Centre in Lakewood, CO, physicans have been performing these knee procedures in the freestanding market for a number of years. According to the PACU nursing supervisor, Kee Merz, when the program began, patients received 24 hour home nursing care and were discharged with PCA pumps for analgesia support.

With experience, physicians and staff have become more comfortable with the safety and comfort level of patients. In particular, the advent of the Cryocuff and ketorolac for pain management spurred a change in the home nursing support required. Today, a primary nurse is assigned to make a preoperative patient visit. This is often in the patient's home, allowing inspection of the home situation as a positive addition to the preoperative assessment. The patient returns home about 3 hours after surgery primarily with the support of family, although the same primary nurse visits the patient postoperatively at about 4 pm and 10 pm on the evening of surgery to assess the patient and to administer intramuscular ketorolac and intravenous cefazolin. A third home visit on the next morning includes a dressing change, patient discharge teaching, and a discharge nursing assessment. The patient, family, and nurse also may exchange telephone calls during this early period.

This change in postoperative management has come about as a result of improved technology and pharmaceuticals; increased comfort with patient safety levels; experience, both surgical and procedural; and changing public and medical attitudes.

A similar pattern of care has been developed in Anchorage at the Alaska Surgery Centre where Darlene Cameron, RN, reiterates the importance of ketorolac and Cryocuff techniques as the 'key' for pain management, allowing patients to go home soon after surgery. At this centre, patients do not receive a home nurse visit, although a continuous passive motion (CPM) device is put on the patient by a representative of the company once the patient arrives home and telephones the CPM company. Both of these centres report no serious complications, no hospitalizations or resurgeries, and high patient and physician satisfaction with the mode of care.

Twenty-three hour admission units

Some facilities have the availability of keeping patients for a total of 23 hours from the time of their admission preoperatively. This type of care provides essentially the same given to any hospitalized patient: nursing observation and care, medications, meals, access to emergency response personnel, and the security of professional care in the early hours of recuperation. Families are encouraged to be with the patient, and often 'rooming in' of one family member is an option.

In the ASC set in a hospital this type of care may be provided in a special unit designed specifically for 23 hour stay patients. Other options include keeping these patients in the ambulatory surgery unit or, less ideally, assigning them to regular rooms on medical or surgical floors. The restriction of discharging within 23 hours for the patient to be classified as an ambulatory surgery patient (and, thus, receive the best insurance reimbursement or coverage) sometimes leads to very early morning discharges on the day after surgery.

Ambulatory surgery units within hospitals are most often able to provide this level of care, although freestanding surgery centres (FASC) in many states have gained the licensure necessary for extension of care beyond the usual several hours. Heritage Surgery Center in Nashville, TN, is an example of one freestanding surgery centre that has added overnight beds. Like many other centres building 23 hour care units, this centre has furnished the rooms in a decorative, homelike fashion. Cherry furniture, patterned wallpaper and draperies, and floral arrangements to help to make the rooms feel comfortable and warm. Centre administrator, Cynthia Duvall[7], explains that these rooms are often used for children who have had tonsillectomies, so a chaise chair in each provides a comfortable respite for parents who are encouraged to stay with their children.

In such states as Florida, FSCs are restricted legislatively from this service and continue to lobby for access to such licensure. Some FSCs in similarly restricted situations have developed contracts with long-term facilities such as nursing homes or rehabilitation hospitals for use of one or more rooms for the overnight care of ambulatory surgery patients. Depending on the contact specifications, these rooms may be redecorated and furnished and kept solely for the use of surgery patients, or they may be used dually by the resident and contracting facilities. While this plan is not ideal, it provides centres that would otherwise be unable to keep patients overnight with a resource allowing them to perform more advanced types of cases.

Medical hotels

An option for patients who may have travelled a long distance from home for surgery or who have no one to assist them at home might be a medical hotel. As the name implies, this is a hybrid service with characteristics of both a hotel and a medical facility. Generally speaking, although limited nursing service is sometimes available to patients in this setting, the usual admission criteria require that patients are able to take care of most or all of their own needs and require only the availability of care in the event of a problem or emergency.

This setting differs from a 23 hour admission unit in that it does not provide full service such as ongoing nursing care. Meals and medications may be provided or may be the responsibility of the patient. It is, however, an excellent, cost-effective halfway service for elderly or alone individuals who need the security of a setting where help is readily available. Financial responsibility for this service generally belongs to the patient.

Medical hotels have a variety of faces, depending on the community resources and the investment of the facility. One could consider the use of an actual hotel or motel room combined with the services of a home health nurse to be a medical hotel model. Some larger hospitals may refurnish and designate a wing or several patient rooms for hotel services; others may renovate or lease a nearby structure. Families are encouraged to stay with patients in this setting.

Recovery care centres

As the freestanding surgery market has expanded over the past 20 years, older and sicker patients and more complex surgeries have become the norm. This change has produced the need to develop facilities to provide these patients with extended postoperative care. Recovery care centres are one answer

These centres began to appear where licensure was available, although many states still discriminate against such services even though they have been found to reduce overall healthcare costs. At least 14 states currently have postoperative recovery care centres in operation with 13 others considering the option[8]. Sometimes opposition comes from hospitals that wish to restrict competition, but in some communities, hospitals and freestanding surgery centres are merging forces to develop joint recovery care services[9].

State and local laws governing licensure of such centres regulate many parameters of the recovery care business. For instance, regulating agencies may have specifications for minimum square footage, for the type of emergency equipment available, and for management of dietary and pharmaceutical services. They may establish how long patients may stay and what services must be provided. An example is the 1986 California legislation that created a pilot demonstration program for recovery care in that state. Patient stays of up to 72 hours were allowed and centres could include up to 20 patient beds. A more recent amendment has extended that demonstration project until 1994.

The first facility to open under this legislation was the Fresno Recovery Care Centre in 1988. Attached to the Fresno Surgery Centre, this facility of 20 patient beds boasted an all RN staff and a homelike environment–both of which Tony Carr, CEO at the Fresno facility, credits with contributing to patient's psychological comfort, promoting quality care, and ultimately to reduced length of stays. All the RNs at this recovery care centre are certified in advanced cardiac life support and work 12 hour shifts providing care at a usual 1:3 nurse to patient ratio[10].

Unlike this combined surgery and recovery facility, another private venture stands out as a prototype of a recovery care centre. In Arizona, the Hideaway House was developed and opened in 1979 by a business woman, Carolyn Caine, who saw a market need in her community for aftercare of plastic surgery patients. In 1985 she built a new facility renamed the Surgical Recovery Centre of Phoenix. This facility is separated geographically and by ownership from the community's surgery centres and now provides care for a wide variety of surgical patients. Even in 1986 the centre was caring for patients after traditional choleystectomies, laparotomies, appendectomies, and vaginal hysterectomies[11].

Surgical speciality hospitals

The most recent innovation in the industry is the surgical speciality hospital. This type of facility combines a surgical suite and recovery beds into one unit. Exactly as the name implies, this type of facility is licensed as a hospital, but its service are limited to surgery and its aftercare. Appropriate ancillary related services must be available as well, for instance, laboratory and radiology services. Unlike a recovery care centre, a facility licensed as a hospital is not restricted in patient length of stay and often has less difficulty obtaining payment for services from governmental and private insurers.

TOPS Surgical Speciality Hospital in Houston is a prime example of this new and exciting setting as is the Fresno facility, awaiting licensure as an acute care hospital. The latter has been renamed the Fresno Surgery Centre: The Hospital for Surgery. According to Fresno CEO Carr, little change in their policies or services was necessary to become a hospital except for the addition of an in-house laboratory and the conversion of an existing radiology room previously used for needle localizations to better meet the licensure requirement for broader radiological capabilities.

The special attention to patient comfort and provisions of a wellness-centred approach that have set ambulatory surgery programs apart for years continues to be of prime importance to the Fresno group. As Carr explains, "Good design and a friendly homelike decor help in our quest to reduce patient anxiety, which we all know can, in turn, reduce pain and blood pressure and contribute to reduced length of stays"[12].

One would expect that the lines of differentiation between ambulatory and in-house surgical procedures may become blurred in this setting. The open-ended capability to keep patients after surgery will lend the setting to increasingly more complex procedures, short, of course, of those requiring intensive postoperative nursing care. In fact, one ambulatory surgery centre, turned acute care speciality hospital, that is operated by Medical Care International, recently performed a total hip replacement. The future of these speciality hospitals will be interesting to watch.

Hospitalization

We should not omit the option of hospitalization in a discussion of aftercare. When alternate care settings are not available or are not adequate for patients suffering complications of anaesthesia or surgery, hospitalization is an appropriate step. Within the ambulatory surgery industry there is definitely a 'badge of honour' associated with avoiding hospitalization for patients. In fact, one of the statistics most eagerly shared by freestanding and hospital based ambulatory surgical programs alike is how low a hospitalization rate they can boast.

While avoiding patient complications and resulting hospitalization is an excellent goal, the care afforded by a hospital stay is often the perfect or only appropriate answer for a patient who has suffered bleeding, wound dehiscence, severe pain or vomiting, or a nonrelated medical emergency such as chest pain or an asthmatic attack.

Case study

Consider the young women who, having suffered a missed abortion in her second trimester, underwent a completion suction curettage at Belleair Surgi-Centre, a freestanding centre in Clearwater, FL, She had no problems with the general anaesthetic and recovered in a normal manner. Approximately 2 hours after surgery she had ambulated, voided, and had taken a snack and beverage without nausea. She awaited imminent discharge in the Phase II area of the centre.

Just prior to discharge her intravenous fluids were discontinued and she was escorted to the bathroom for a second time. She became faint and diaphoretic and was taken to a stretcher assessment. The nurse noticed a definite increase in abdominal firmness and a hard, palpable uterine fundus that had not been present on previous abdominal assessment. Her haemoglobin was checked at the bedside and had dropped nearly 4 grams compared to the preoperative value. The intravenous hydration she had received was obviously considered to be a factor contributing to some of that change.

The surgeon returned to the centre, and after assessing the patient, returned her to surgery where a diagnostic abdominal laparoscopy showed no free blood in the abdomen. She had none or scant vaginal bleeding and was diagnosed with intramural uterine hemorrhage. Her physiological parameters were generally stable and she was alert after her second procedure.

Hospitalization was definitely indicated for further observation, and monitoring and she was transported there via ambulance. She was later found to have laboratory changes indicative of disseminated intravascular clotting. Luckily, her systemic symptoms never progressed to an acute stage, and she recovered uneventually to go home several days postoperatively. She clearly exemplified the type of patient for whom hospitalizaion is essential.

In such instances, hospitalization is a valid and very positive step. It should be portrayed in that manner to the patient and family who may be frightened or angry about the complications that have occurred. The attitude and demeanour of the staff and physician caring for the patient definitely affects the overall attitude of the patient and family in regards to unexpected hospitalization[13]. One positive aspect of overnight admission that can be conveyed is the fact that around-the-clock nursing care will eliminate the worry of the family member who may fear not being awake if the patient needs help. Some family members may not be physically able to provide the level of care required. Often the family members will be relieved that they no longer hold full responsibility for the patient, particularly if bleeding or vomiting are involved or if it is a child who is experiencing complications.

The future

The necessary extent of care following ambulatory surgery is most often limited to a few hours spent in the ambulatory surgery unit itself. When complex procedures, medically compromised patients, or unexpected complications are involved, the availability of further care in an appropriate and safe location must be secured. Any physician or facility providing surgery and anaesthesia services must have established plans in place for that essential care.

Today's difficult economic picture makes forecasting the viability of these current programs or the development of future care sites difficult. Healthcare reforms may open the door to many innovative ideas as long as those programs can show their cost-effectiveness and safey. On the other hand, opportunities for growth in the freestanding and other nonhospital facilities may be restrained if the healthcare reform movement favours only programmes that can provide comprehensive services under one package.

Regardless of the types of settings or legislative restrains we will see in the future, we do know that the economy will be the number one driving force in healthcare in the upcoming years. The process of early discharge after surgery will continue and will probably grow to encompass even more complex procedures. It will be our challenge to show that the types of care settings we design and promote are safe and cost-effective. We also must assure that the human touch remains the focus of our care.

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Review

A history of the Society for Ambulatory Anesthesia

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A vision of the future arriving: formation of the Society

In 1984, Bernard V Wetchler raised the question, "Do you feel the time is right to start an ambulatory anesthesia society?" At the second annual Symposium on Anesthesia for Ambulatory Surgery sponsored by the Medical College of Virginia, Drs Wetchler, Burton S Epstein and Surinder K Kallar prepared a list of anaesthesiologists who were invited to a meeting 'to discuss the formation of a Society for Ambulatory Surgery Anesthesia.' This formative meeting was held during the American Society of Anesthesiologists (ASA) meeting in New Orleans, Louisiana on October 29, 1984. Twenty anaesthesiologists were present and provided input on the formation of the new society. A bye-laws committee was formed chaired by Stanley Bresticker, a nominating committee chaired by Herbert D Weintraub, and an administrative assistance committee chaired by George Rector. Richard Keenan volunteered the Department of Anesthesia at the Medical College of Virginia to serve as the society's office. Surinder Kallar was elected Secretary pro tem, and Bernard Wetchler was elected President pro tem.

In April 1985, a meeting of the fledgling society was held during the third annual symposium in Williamsburg, Virginia. Dr Stanley Bresticker proposed the name 'Society for Ambulatory Anesthesia' (SAMBA) and this was approved. Proposed bye-laws and the formation of a newsletter were reviewed and accepted. The first slate of officers consisted of: President – Bernard V Wetchler; President Elect – Burton S Epstein; First Vice-President – Beverly K Philip; Second Vice-President – Paul F White; Secretary – Surinder K Kallar; Treasurer – Stanley Bresticker; At Large Members of the Board – Harry C Wong, Randolph M Jackson, Herbert D Weintraub and Wallace A Reed. Charter membership was solicited in 1985; by July, SAMBA had 52 charter members and by October, 161 charter members. The Society's first educational meeting was held in conjunction with the Medical College of Virginia's programme in April, 1986 and has been held annually since. The first edition of the Society newsletter 'Ambulatory Anesthesia' appeared in January, 1986, with Paul White as Editor. By October, 1986, there were 482 anaesthesiologist members as well as four commercial benefactors.

The missions of the Society

The bye-laws of the Society for Ambulatory Anesthesia contain a statement of the organization's goals and missions. These missions are:

1. To advance the study of ambulatory anaesthesia, to contribute to its growth and influence, to encourage specialization in the field of ambulatory anaesthesia and to encourage high ethical and professional standards by fostering and encouraging research, education, and scientific progress in ambulatory anaesthesia;
2. To publish and encourage the dissemination to the profession and to the public of information concerning the role of anaesthesia in ambulatory surgery and to issue publications of scientific and cultural interest;
3. To support, encourage, and participate in the development and promotion of policies and programmes of the American Society of Anesthesiologists and other professional organizations regarding ambulatory anaesthesia; and
4. To support, encourage, and participate in the development of guidelines of postgraduate education for qualification as a subspecialist in ambulatory anaesthesia and guidelines for approval of postgraduate training programmes in ambulatory anaesthesia.

Growth of the Society

SAMBA's first president, Bernard V Wetchler completed his term of office in October 1987. The accomplishments during those first formative years were impressive. The membership reached 1053, and almost 400 anaesthesiologists attended the Society's 1987 second Annual Educational Meeting. The Newsletter was sent to the

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members four times a year, and to the entire ASA membership twice yearly starting in June, 1987. SAMBA was granted membership on the ASA Committee on Subspecialty Representation, and hosted its first breakfast panel at the ASA Meeting on October 14, 1987. The Society's offices were moved to ASA Headquarters at Park Ridge, IL. There was a strong early relationship between SAMBA and ASA through the latter's Committee on Ambulatory Surgical Care, chaired by Harry C Wong.

At the completion of his term as second SAMBA president in October 1988, Burton S Epstein listed the accomplishments achieved during his tenure. The membership grew to 1064 active plus 39 resident physicians. The Third Annual Meeting was held in April, 1988, the ASA SAMBA breakfast panel was continued and the Newsletter edited by Raafat S Hannallah was expanded. The organization was stable financially, with support from its members and from industry. Dr Epstein also paved the way for future directions and development, including improved benefits of membership with an enhanced newsletter, annual meeting and administrative and educational services, to encourage active member participation in the Society.

In 1989, the annual term of office was changed to end in April, to coincide with our annual educational meeting. Surinder K Kallar completed her term in April, 1990. During this time, society membership grew to 1324. The Fourth and Fifth Annual Meetings were held in April 1989 and 1990, with 320 and 402 registrants each. Awards for best scientific research presentations at the annual meetings were established, sponsored by the Ambulatory Anesthesia Research Foundation. National recognition of ambulatory anaesthesia was enhanced during this time period, when SAMBA was granted representation in the ASA House of Delegates as an anaesthesia subspecialty organization. Also at the ASA annual meetings, SAMBA continued to host its breakfast panels. The Newsletter continued to grow. The scope of the Society was broadened by a bye-laws change which created an additional category of membership for international anaesthesia physicians.

Harry C Wong was Society president for the year ending April, 1991. Membership reached 1521. At the Annual Meeting, attendance was 404 and Resident Travel Awards for resident physician research presentations were first presented. SAMBA members championed the establishment of separate research sessions on 'Ambulatory Anaesthesia' at the ASA annual meeting, and the first of these was in October 1990. Ongoing projects were the ASA SAMBA breakfast panel and the Society Newsletter.

SAMBA continued to develop. In the year ending April, 1992, led by Beverly K Philip the Society addressed many of the goals in its mission statement. In the area of research, SAMBA continued to encourage the presentation of research investigations with meeting awards. In the area of education, there was increased member participation in the Newsletter under editor Sujit K Pandit. The Society again presented its ASA breakfast panel. The 1992 Seventh Annual Meeting was the largest yet, with 528 registrants. It was the first to benefit from accreditation for continuing medical education jointly by the ASA and SAMBA as its subspecialty organization. For the first time in 1992, meeting sessions were recorded; audiotapes were given to attendees and were made available for sale for continuing education. Also for the first time, selected lectures were published as a supplement of the Journal of Clinical Anesthesia.

During this year, SAMBA expanded its educational mission to address the needs of those anaesthesiologists in their residency training. To that end, SAMBA developed educational guidelines for the training of anaesthesia residents and subspecialty fellows. These guidelines consist of a 'core curriculum for ambulatory anaesthesia' to be covered in the first three postgraduate years and an 'advanced curriculum for ambulatory anaesthesia' for fellowship training. The first section addresses specific areas of knowledge needed in the education of all anaesthesiologists in the subspecialty, and the second section addresses research in ambulatory anaesthesia and experience with administrative needs. Annotated references are given.

SAMBA also continued to fulfill its mission to develop policies and programmes at the national level. In 1992, SAMBA began representing the interests of ambulatory anaesthesia in the accreditation process by participating in the Professional and Technical Advisory Committee of the Joint Commission's Ambulatory Health Care Accreditation Program. Also in that year the ASA Committee on Ambulatory Surgical Care with participation of individual SAMBA members developed a brochure on ambulatory anaesthesia, used to educate patients and the public at large about the role of anaesthesiologists in ambulatory surgical care.

In May, 1992, Herbert D Weintraub assumed the presidency of SAMBA. Dr Weintraub is leading this Society in enhanced growth and participation in education, activities and research support. There is an increased awareness of our Society and of the leadership and expertise we offer in the anaesthetic care of ambulatory surgery patients. Active participation by Society members continues to be welcome and encouraged.

Toward the future

In July of 1991, SAMBA's Board of Directors held a retreat to identify long-term goals. The outcome was formulated by SAMBA's committees into a long-range action plan. The three major areas of this action plan are:

1. Education: addressing educational guidelines (see above), the Annual Meeting and refresher courses;
2. Research: including establishing monetary grants for research in clinical ambulatory anaesthesiology, to be sponsored both by SAMBA entirely and by joint sponsorship with the Foundation for Anesthesia, Education and Research (FAER). A Research Committee was also formed; and

3. Membership: with increased involvement and recruitment of all categories of members. An informational brochure about the Society is planned.

All in all, the Society for Ambulatory Anesthesia has experienced strong growth and development. It has achieved major milestones towards its goals and missions. Through SAMBA's efforts, ambulatory anaesthesia has gained acceptance as a recognized subspecialty. The Society has grown to over 2000 members. This parallels the growth of ambulatory anaesthesia and surgery, which have become the majority of procedures being done in the USA today. We look forward to continued growth, both national and international.

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Review

Why is outpatient surgery still limited?

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Despite positive and attractive considerations, outpatient surgery has not developed in Europe as it has in the USA for many different reasons. Negative forces are evident at each level of health care system: political authorities, hospital administration, faculty of medicine, insurance companies, surgeons, anaesthesiologists, patients and their families. New strategies should be developed to overcome these oppositions and to promote ambulatory surgery.

Key words: Outpatient surgery, ambulatory surgery, organization, new strategies

Numerous factors, which nowadays are well analysed, favour an increased development of outpatient or ambulatory surgery in selected cases according to precise criteria. Some of which are:

- Ambulatory surgery is cost-effective;
- Ambulatory surgery is as safe as inpatient surgery, if patients are well selected;
- The risk of nosocomial infections is reduced by ambulatory surgery;
- Ambulatory surgery may reduce the need for hospital extension;
- Patient's lifestyle is minimally changed;
- Disability is decreased and allows earlier return to work.

Despite these positive and attractive considerations, outpatient or ambulatory surgery is not as popular in Europe as it is in the USA, for various reasons.

Negative forces opposed to ambulatory surgery

Opposition to ambulatory surgery can be found at different levels in the organization of health care. These forces are listed in Table 1. We will briefly discuss them:

Political authorities

Political authorities usually misunderstand the benefits of ambulatory surgery. They fear the loss of state control of surgery and are afraid of the development of an increasing number of freestanding units. Therefore, they impose severe regulations and detailed control procedures on the organization of surgical units.

Table 1. Possible negative forces opposed to ambulatory surgery

Political authorities
Hospital administration
Faculty of medicine
Insurance companies
Surgeons
Anaesthesiologists
Local conditions
Patient
Patient's family

Low price scales are prescribed to discourage the development of ambulatory surgery outside public hospitals, as is the case in Switzerland. New ambulatory surgery beds, as in France, can be opened only if hospital beds are closed. This is proof of the misunderstanding: ambulatory surgery enables the freeing of hospital beds to cater for more severe cases and for old patients who will need prolonged hospital stay, due to the longer life expectancy of our population. Ambulatory surgery allows better use of theatres if performed in specially dedicated units.

Prospective statistical analysis is necessary to convince the authorities of the necessity to develop ambulatory surgery.

Hospital administration

Public hospital administrations may be reluctant to develop facilities for ambulatory surgery as hospital-controlled integrated units or as hospital-controlled autonomous units. The building or remodelling of existing spaces involves new expense in the face of limited budgets. Rooms should be comfortably furnished. Administrative staff and nurses should be competent,

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efficient and familiar with outpatient management. The sharing of new equipment between hospital and outpatient units should still be possible, if limited. Hospital administration and organization of operating rooms should provide the ambulatory unit with an efficient care-scheduling system.

Because of the operational complexity of ambulatory surgery and the large amount of income generated by this activity, ambulatory surgery programmes should be structured as separate business units even when they are part of hospitals. Operating costs can also be cut by reducing the turnover time between cases, so that surgical suites do not remain vacant. Administration is usually not trained and works too slowly for ambulatory surgery management.

Faculty of medicine

Outpatient surgery is not taught. The medical faculties fear to lose patients for the surgery training programme they offer. A good organization should overcome this fear. Furthermore, it has been well proved that patients treated by surgeons-in-training, well controlled by senior surgeons, are not submitted to increased risks. Security is even higher. Patients who can choose between being treated outside the public hospital in well-controlled outpatient units, prefer, for security reasons, to be taken care of in teaching hospitals. No conflict should therefore occur between training programmes and outpatient surgery.

Health insurance

Insurance companies are only interested in the development of ambulatory surgery as far as they can profit from it. Financial competition to some extent should be introduced between in- and outpatient surgery. This is possible only if the insurance companies have to cover the real costs in case of hospital stay and not flat rate amounts. In this case, even fee-for-service for ambulatory surgery is cheaper. Insurance companies, more frequently due to strict regulations, do not consider the fact that ambulatory surgery shortens waiting lists for hospital entries, allows better and earlier planning for surgery and reduces patients' time off work. These conditions are also cost effective.

Surgeons

A surgeon may be reluctant to perform outpatient surgery for many reasons:

- appropriate facilities are not always available and some day-case units are poorly organized and managed;
- he may fear that the quality of service offered is not as good as for inpatients;
- he is not familiar with or trained for ambulatory surgery;
- he is afraid of possible postoperative complications and does not wish to be disturbed at night if some occur;
- he may charge more in case of hospital stay.

The first four reasons can be avoided by training, experience and a well-organized surgical unit. As to the last reason, the political authorities are solely responsible for the unattractive financial aspects.

Anaesthesiologists

Anaesthesiologists can refuse to cooperate in ambulatory surgery if they do not have facilities to perform optimal preoperative evaluation, and the use of a well-organized recovery room with trained nurses. Close cooperation between surgeon and anaesthesiologist is mandatory. Some financial aspects should also be considered: in case of loco-regional anaesthesia, for example, when the anaesthesiologist is required just for a 'standby', he should be fully recompensed. 'Standby' should be as well paid as general anaesthesia.

Patient and patient's family

Detailed information should be given to the patient and his family. Nevertheless they may be opposed to ambulatory surgery for various reasons:

- patient may prefer to spend days in hospital or private clinic in order to recover quickly (for example, a mother with children at home);
- having paid expensive insurance rates for many years without having been ill, the patient may feel entitled to profit from a hospital or private clinic stay;
- he may not be interested in going through early surgery, or having only a short time off work;
- financial contribution from the patient in the case of outpatient surgery is a penalty which does not exist in the case of hospital stay.

Only some modifications of these penalties can overcome the financial aspects. Surgeons may, from time to time, have to order a hospital stay to prevent postoperative infections, even if, from a purely medical point of view, ambulatory surgery could be performed (for example, to prevent a farmer who has just gone through more or less extensive hand surgery, from milking his cows on the same day!).

Local conditions

Local conditions may be very different from one place to another. If freestanding units and outpatient clinics linked with hospitals are not attractive nor sufficiently organized and staffed, patients may prefer a hospital stay to ambulatory surgery. If postoperative care is not sufficient or if access to the medical centre is difficult in case of complications in the postoperative period, the patient

may prefer to stay at the hospital until his condition improves.

Conclusions

We have to keep in mind that our aim is to provide our patients with the best available quality of care at an optimal security level. We have therefore to identify and to analyse precisely the various oppositions to the development of ambulatory surgery. We have to elaborate new strategies to convince political authorities, hospital administrations, medical faculties, insurance companies, surgeons, anaesthesiologists, patients and their families, of the benefits resulting from ambulatory surgery.

Performance comparisons should be established for various and frequent surgical procedures. Further medical and socio-economic results are necessary to prove the value, safety, quality, medical advantages and cost effectiveness of ambulatory surgery to those who are against this new trend.

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Review

The growth of ambulatory surgery centres in the United States

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This paper looks at the development of surgery centres in the USA and the factors which have had an important impact on their growth and future. This includes growth trends and demographics such as the types of procedures performed at the surgery centres. Other factors looked at include the economic impact of surgery centres and reimbursement by government health programmes and other third party payors. Studies on complications and patient satisfaction also discussed.

Key words: Surgery centres, ambulatory surgery

The concept of outpatient surgery dates back to the early 1900s, however, the evolution of ambulatory surgery centres (ASCs) in the USA did not take place until 1969. This paper will look at the development of surgery centres in the USA and the factors which have had an important impact on their growth and future. When discussing ambulatory surgery centres the sites referenced are the 'freestanding' facilities. This can include surgery centres that are housed in buildings where they are the sole entity within that structure. These facilities can also include surgery centres that are housed within a high-rise building or structure housing other medical and/or businesses. The surgery centres described below are not housed within a hospital.

A growing trend

In 1970, Dr Wallace Reed and Dr John Ford opened the first freestanding ambulatory surgery centre in the USA. An attempt to open a facility the year before had been made by a physician in Rhode Island, but the project failed due to lack of financial backing. The primary issue that initiated the planning of this first successful freestanding surgery centre, which was built in Phoenix, Arizona, was the concern on the part of patients, insurance companies and the government of the high costs of hospital care[1]. A 1968 report of the United States National Advisory Commission on Health Facilities included in its recommendations to lower health care costs that:

1. experimentation is needed to develop effective programmes for financing health services from a variety of sources; and
2. communities should aim to improve the less developed components of comprehensive health care services[2].

The United States health insurance industry was also looking for ways at this time to find alternatives to high cost hospital care. In early 1969 a member of the Health Insurance Advisory Council stated that the solution was in:

1. stimulating experiments and innovations in the organization and delivery of health care services;
2. obtaining broader health insurance coverage for alternatives to inpatient care; and
3. involving the medical profession increasingly in the effort to control costs[3].

There was also a call for alternative health care delivery sites, by physicians and nurses in the hospitals who found it inconvenient to have to move from the main operating room to an emergency room or small treatment room to attend to their ambulatory surgery patients. These rooms were not equipped for outpatient surgery.

The concept of providing safe outpatient surgical care at lower prices in the USA had been discussed several years earlier. In the June 27, 1966 issue of the *Journal of the American Medical Association* it was noted from a study on outpatient surgery that, "It is possible to conduct a program of anesthesia for outpatient surgery without compromising patient safety. Intelligent selec-

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Table 1. Number of surgery centres

Year	*Total no. surgery centres*
1970	2
1971	6
1972	13
1973	21
1974	33
1975	42

Table 2. Number of surgery centres and operating rooms

Year	*No. surgery centres*	*No. operating rooms*
1976	67	219
1977	80	258
1978	103	331
1979	111	382
1980	127	431

tion of cases and anesthesia method minimizes the incidence of complications. The feasibility and practicality of outpatient surgery were demonstrated by the fact that only 33 of 804 patients (4.1%) were admitted as inpatients, and most of them during the early part of the study period. A properly equipped and staffed outpatient surgical unit is necessary; the availability of such a facility makes rapid expansion of surgical capabilities feasible in civil disaster. This flexibility is an attractive feature which can be helpful in obtaining funds for such expansions. An estimated $28 000 in savings to patients or insurance companies was achieved and approximately 1000 hospital days were saved during the study period"[4]. Thus, the need and instigation of the concept had been established for the first freestanding surgery centre to be built in the USA. After being open for its first six months in 1970 the 'Surgicenter', as it was called, had 225 surgeons on staff and approval for reimbursement from 44 insurance companies. Another ambulatory surgical facility opened later in 1970. During 1970 over 5700 procedures were performed at these two facilities. In 1971 four more ASCs opened around the country and the American Medical Association passed a resolution endorsing the concept of outpatient surgery under general and local anaesthesia for selected procedures and patients[5].

In 1973 the American Society of Anesthesiologists issued 'Guidelines for Ambulatory Surgical Facilities'. Then in 1974 a contract was signed for a Medicare (the US federal government programme that provides healthcare for individuals 65 years of age and older) demonstration project with six surgery centres. By 1975 there were a total of 42 surgery centres in the USA[6].

The real growth in outpatient surgical centres began after 1976 with 25 new facilities opening their doors to patients. Ambulatory surgery centres were not confined to a freestanding building. Some were constructed in high-rise buildings or as part of other medical facilities. By 1980, 10 years after the first ASC opened in Phoenix, Arizona, there were over 120 surgery centres in the USA[7].

In the 1980s over 900 ASCs have opened, bringing the total to 1221 freestanding surgery centres as of December, 1989. The number of surgical procedures increased from 1.72 million performed in surgery centres in 1988 to 2.16 million in 1989. This represents a 25.6% increase[8]. Ophthalmic, gynaecological, otolaryncological and orthopaedic surgeries represent 67% of all procedures performed in US surgery centres. Two-thirds

Table 3. Number of surgery centres and procedures performed

Year	*No. surgery centres*	*Total surgeries performed*
1985	459	783 864
1986	592	1 033 604
1987	865	1 383 540
1988	964	1 722 367
1989	1221	2 162 391

Table 4. Specialties performed at surgery centres

Procedure	*Performed (%)*
Opthalmology	28.2
Gynaecological	18.9
Ear/nose/throat	10.8
Orthopaedic	9.5
General	8.7
Plastic	7.7
Podiatry	4.6
Urology	3.8
Gastroenterology	3.2
Dental	1.7
Pain block	1.3
Neurology	0.3
Other	1.3
Total	100

Table 5. Ownership of surgery centres

Ownership of surgery centres	*1989 %*	*1988 %*
Independent	67.1	68.4
Corporation	21.5	20.8
Hospital	11.4	10.8

(67.1%) of the surgery centres in the USA are independently owned. One-third of the remainder (11.4%) are hospital-owned and the other 21.5% are owned by corporations[9].

The largest corporate chain ASC owner today is Dallas-based Medical Care America (MCA). In 1987,

MCA bought Alternacare (Los Angeles, CA) which had 13 facilities bringing MedCare's total to 52 ASCs nationwide. Then in 1989 MCA bought Medivision, a company composed of ophthalmic facilities. Today MCA has a total of 89 surgery centres within its corporation and has merged with a large home infusion company, Critical Care America.

From 1984 to 1989 hospitals have lost 13% of the market share of outpatient surgery. In 1984 they performed 89% of all outpatient surgery whereas in 1989 they performed 76%[10].

Reasons for growth

There appear to be three primary factors impacting the growth and use of ASCs. They are advances in medical technology, consumer awareness and economics.

The medical advances that have been developed since 1970, when the first freestanding surgery centre was opened are numerous. Several advances in particular which have contributed greatly to the growth of ASCs include technological advances such as the laser, endoscopic and arthroscopic surgical instruments. These advances have allowed physicians to perform many more procedures on an outpatient basis than previously. Approximately 60% of all surgery performed today can be done on an outpatient basis. Procedures such as vaginal hysterectomies, cholycystectomies, hip arthroscopy and modified mastectomies have been performed on an outpatient basis[11]. Also, the advances in analgesia allow the patient to be alert and able to go home within a few hours after their surgery.

The patient, as well as the physician, is becoming more aware of the advantages of having surgery performed in outpatient surgery centres. Physicians find it easier to schedule time for operating rooms in ambulatory surgery centres, compared to the hospitals where physicians compete for operating room time with inpatient surgery and emergency cases. The patient finds surgery centres comfortable and suited for their needs – a setting for the healthy patient undergoing elective surgery, compared to a hospital setting that also serves patients who are more seriously ill.

Economics is playing an important role in the growing utilization of outpatient surgery centres by third-party payors. Surgery centres can maintain lower overheads and provide high quality healthcare at lower costs, compared to hospitals which must remain open and staffed 24 hours a day as well as providing other, costlier services for sicker patients. With rising medical costs, third-party payors are taking a closer look at ASCs as the site for outpatient surgery for their beneficiaries. Approximately 50% of all surgery centres had contracts with health maintenance organizations (HMOs) or prospective payment organizations (PPOs). Patients who must pay coinsurance also find the lower costs of ASCs attractive. A survey conducted by Blue Cross Blue Shield of North Carolina (a large insurer of outpatient surgery in that state) of a comparison of hospital and surgery centre charges found an overall difference of 47%. That is, the total charges for a hospital compared to the surgery centre for 21 procedures performed in each was 47% less in the surgery centre than in the hospital for exactly the same procedure.

This leads us to another factor that has a major impact on the utilization of surgery centres. That factor is outpatient surgery performed in ASCs for Medicare beneficiaries. Medicare is the US federal government healthcare programme for citizens over the age of 65. It is administered by the federal agency called the Health Care Financing Administration (HCFA).

The US government first approved for Medicare to pay the costs of their patients who have surgery performed in ambulatory surgery centres in 1982. At that time they only approved reimbursement for approximately 100 procedures, despite the fact that they were reimbursing for all outpatient surgery if performed in a hospital. The 100 procedures if performed in an ASC were classified by Medicare according to a four-group reimbursement classification system which ranged from Group 1 ($231) to Group 4 ($336). This did not include the surgeon's fee but was reimbursement for the facility to cover its costs for nurses and staff salaries, utilities, equipment and medical supplies used, and overheads. Physicians, nurses and administrators who own and operate surgery centres felt that the reimbursement rates were too low to cover costs in many instances. They also felt that HCFA should not have limited to only 100 procedures those which Medicare would reimburse. If a procedure was reimbursed at a hospital as outpatient surgery it should also be reimbursed in an ASC.

ASCs must pass strict inspections by HCFA in order to be reimbursed for Medicare beneficiaries. Thus, if a facility passes such an inspection it is deemed safe and properly staffed and equipped to operate on these patients. The Federated Ambulatory Surgery Association, and other groups representing outpatient surgery in the USA, have been working very hard to have the US Congress change the regulations that limit the number of procedures that Medicare will reimburse if performed in an ASC, as well as increase the amount reimbursed. In 1987 we were successful in getting such an amendment passed that called for annual updatings of the reimbursement rates and bi-annual updating of the list of procedures. However, we are now seeking additional amendments to ensure that HCFA follows Congress' mandates in a timely manner.

Currently over 2100 procedures are reimbursed by Medicare if performed in an ASC. These procedures are divided into eight payment groups ranging from $295 to $940.

There is a commitment on the part of Members of Congress and the President of the United States to lower the costs of health care for Medicare beneficiaries while insuring high quality medical care. Due to the lower overheads surgery centres have compared to hospitals it is believed that surgery centres will play an active role in helping the government lower healthcare costs and maintain high quality care.

Table 6. Comparison of hospital and FSAF institutional charges for 21 frequently performed surgeries

Outpatient procedure	*Institutional charge — hospital* $	*Institutional charge — FSAF* $	*Hospital charge @ 70%* $
Removal of skin lesion, trunk	273	280	191
Removal of skin lesion, elsewhere	262	256	183
Removal of breast lesion	867	523	607
Remove wrist tendon lesion	879	517	615
Knee arthroscopy	1462	837	1023
Repair of nasal septum	1223	657	856
Remove tonsils and adenoids	964	492	675
Removal of tonsils	998	464	699
Upper GI endoscopy diagnosis	375	166	262
Diagnostic colonoscopy	461	267	323
Repair inguinal hernia	1271	601	890
Cystoscopy	453	259	317
Circumcision	952	409	666
Removal of sperm duct(s)	452	293	316
Biopsy of cervix	940	429	662
Dilatation and curettage	821	403	575
Laparoscopy of pelvis	1066	549	746
Revise median nerve at wrist	834	552	584
Lasering of secondary cataract	302	132	211
Remove cataract, insert lens	2012	835	1408
Create eardrum openings	650	398	455
Average	834	444	584
% Difference	47%	24%	

Quality of care

Of primary concern to the physicians, nurses, administrators, patients and payors for healthcare in the USA is the quality of medical care.

Government regulations

In the USA ASCs are among the most heavily regulated providers of medical care. Of the 50 states, 41 require ASCs to obtain state licensure and these states usually inspect licensed facilities at least once a year. In addition, as noted previously, surgery centres wishing to be reimbursed for Medicare patients must undergo inspections as conditions of participation (as hospitals must) by the federal government and obtain certification as a Medicare provider.

Accreditation

In addition to state and federal inspections, many surgery centres choose to go through a voluntary accreditation process conducted by their peers. Many of these peer-related surveys for surgery centres are conducted by the Accreditation Association for Ambulatory Health Care (AAAHC).

In the early 1970s, when the surgery centre industry was just beginning, FASA recognized the need for the development of voluntary standards. It developed standards and in 1975 began conducting an accreditation programme for surgery centres.

In 1979, with the cooperation of several other associations involved with ambulatory health care (e.g. college health facilities, physician group practices and community health centres) FASA helped organize AAAHC. The primary purpose of AAAHC was, and still is, "to organize and operate peer-based assessment, education and accreditation programmes for ambulatory health care organizations as a means of assisting them to provide the highest achievable level of care for recipients in the most efficient and economically sound manner"[12].

AAAHC established standards for accreditation. Applicants for AAAHC accreditation are provided a manual to help them prepare for their accreditation survey. They then undergo a one to two day survey conducted by two or three professionals (usually a physician, nurse or surgery centre administrator). These surveyors undergo specific initial and ongoing training on codes and all components of the surveying process. Following their survey the survey team submits a report noting any deficiencies. Upon review by an accreditation committee the centre is awarded a 1–3 year accreditation certificate or is denied certification if warranted. Thus, between state licensure surveys, federal Medicare surveys and peer-conducted accreditation surveys, surgery centres in the USA undergo rigorous scrutiny to ensure quality of care.

Studies on complications and satisfaction

In 1984 FASA conducted a year-long study of complications experienced by patients at surgery centres and the factors that influenced the occurrence of those complica-

Table 7. Complications experienced

Aetiology	*Complications*
Primarily related to surgery	366
Primarily related to anaesthesia	104
Primarily related to pre-existing disease	49
Multiple factors, cause unknown or unclear, fortuitous	151

Table 8. Site of complications

Phase of patient care	*Complications %*
Operating room	14
Post-anaesthesia care unit	17
Post-discharge (14 days)	69

Table 9. Types of complications

Surgical procedure	*No. complications*
Dilatation & curettage	41
Myringotomy	40
Tonsillectomy and/or adenoidectomy	32
Excision of breast mass	20
Cystoscopy	15
Laparoscopy, diagnostic	14
Laparoscopy, sterilization	14
Arthroscopy of knee	11
Augmentation mammoplasty	11
Excision of soft tissue mass(es)	11
Excision of skin lesion(s)	6
Dental extractions	8
Herniorrhaphy	5
Bunionectomy	4
Cataract extraction with I.O.L.	2

tions[13]. The questionnaire which 40 ASCs completed for each of its patients in 1984 provided a multi-dimensional view of the ambulatory surgery population. This population encompassed 87 492 patients.

A summary of the complications associated with each of four general categories of aetiology: surgery, anaesthesia, pre-existing disease and multiple factors/other causes, are depicted in Table 7. The incidence of major complications was low – less than 1%. There were 635 patients who experienced at least one complication. About two-thirds of the complications occurred in the post-discharge period.

The two most common complications were bleeding and wound infection; however, the incidence of wound infection was very low and the incidence of bleeding was well within the anticipated and established range. There was a definite relationship between the incidence of complications and the length of surgery. In addition, there was a significant relationship between complications and certain specific surgical procedures such as tonsillectomy and adenoidectomy, augmentation mammoplasty, arthroscopy of the knee, and other more complex plastic surgical procedures.

There was only one death reported during the course of this study. The patient was a 75 year old man who expired on the third post-operative day. He had a history of severe and multiple pre-existing diseases. He was scheduled for direct laryngoscopy and bronchoscopy using general anaesthesia. His course during the operating room and post-anaesthesia care unit phases of care were uneventful. The patient died on the third post-operative day following a myocardial infarction. There was no evidence that the patient's experience in the ASC was related to his death.

A more recent study, conducted in 1988 by the US Department of Health and Human Services' Office of the Inspector General (OIG), compared Medicare beneficiaries' satisfaction with selected outpatient surgical and diagnostic procedures in both hospital outpatient departments and ASCs[14]. The OIG surveyed 837 Medicare beneficiaries who had had either cataract extraction with introcular lens implant, upper gastrointestinal endoscopy, colonoscopy or bunionectomy procedures between January and March of 1988. The major findings from the survey were as follows:

- Beneficiaries prefer outpatient surgery to inpatient hospital stays;
- Beneficiaries were very satisfied with both ASCs and hospital outpatient departments: 98% of ASC patients compared to 94% of hospital outpatient departments rating the facilities good or better;
- Most respondents reported no postoperative complications;
- Postoperative care was not a problem for most beneficiaries;
- Physicians, not beneficiaries, decide whether the surgery will be performed in an ASC or the hospital outpatient department.

The report went on to pronounce ASCs and hospital outpatient departments, "equally safe environments".

Reasons patients cited for a preference of ASCs over hospital outpatient departments included less paperwork, less cost and a more convenient location and parking. Also sited was no waiting at the ASC, more organized and friendlier staff compared to crowded and uncomfortable hospital settings. It appears from the survey that respondents who had cataract surgery spent less time at the ASCs than they did in the hospital outpatient departments. Two-thirds of the ASC cases spent less than four hours in the facility, whereas, 25% of the hospital department cataract patients spent more than six hours at the hospital. Thus, the growing preference for outpatient surgery to inpatient hospital surgery and the ability of physicians to perform more procedures on an outpatient basis due to advances in analgesics and medical technology point to future growth of surgery centres in the USA.

The future for ASCs

As noted previously, over two million procedures were performed in ASCs in 1989. This figure exceeded 2.5 million in 1991.

In addition to improved drugs and medical technology, the development of overnight recovery care centres on the medical scene in the USA has expanded the scope of complexity of procedures that can be performed in surgery centres. These overnight recovery care centres currently exist in states such as Arizona, North Carolina and California. In fact, the state of California has approved a demonstration programme on utilization of recovery care centres there. The purpose of the overnight recovery care centre is to provide a lower costing alternative to hospitalization when a patient who has undergone outpatient surgery may need observation or minor medical attention for 24–48 hours following surgery. Not being in need of the more expensive, in-hospital setting, recovery care centres allow a patient to undergo their surgery at the less costly outpatient surgery centre and then spend a night at the recovery care centre which is next to or connected with the ASC.

The overnight recovery care centres can provide a more comfortable, less hospital-like setting for the patient and his/her family. The overnight recovery care centre provides homelike bedrooms which aesthetically include the necessary safety precautions such as oxygen in each room. Also, patients have comfortable lounge areas to relax in and receive gourmet-quality meals. The acceptance and development of the overnight recovery care centre as part of the outpatient surgery experience will assist in the growth of the number of surgical procedures performed in ASCs.

Conclusion

It has been predicted that by 1993 there will be over 1600 ASCs in the USA. Looking back at our beginning in 1970 with only two ASCs performing 5700 procedures that year it is apparent that the once small and frail surgery centre industry has survived, proven itself as a viable and necessary part of the US healthcare delivery system and is now thriving into the 1990s.

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Original Papers

Ambulatory tonsillectomy

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While it is generally agreed that the majority of patients can safely undergo ambulatory tonsillectomy, there is considerable debate about the suitability of certain groups of patients for ambulatory tonsillectomy. Patients younger than three years of age, and those with obstructive sleep apnoea or associated medical conditions may not always be appropriate candidates for ambulatory tonsillectomy. This article examines the safety and limitations of ambulatory tonsillectomy, patient selection criteria, medical management and discharge guidelines pertaining to tonsillectomy.

Key words: Ambulatory, tonsillectomy

Perhaps no other surgical procedure has evoked more controversy in the medical as well as the lay press over the past 50 years than tonsillectomy or tonsillectomy and adenoidectomy (T&A). Tonsillectomy has at some time been recommended for almost every childhood disease, including mental retardation and enuresis[1]. The controversy over indications of tonsillectomy still persists, but more recently the focus has shifted to merits of ambulatory tonsillectomy. While almost everyone agrees that outpatient surgery saves money, many believe that ambulatory tonsillectomy may not be safe. However, there is increasing pressure from insurance companies to perform tonsillectomy on an ambulatory basis. Some firms have limited reimbursement for tonsillectomy almost exclusively to cases performed on an ambulatory basis; but they do make exceptions for certain medical conditions[2]. Cost-containment pressure from non-physician groups has set off a heated debate about the advantages and disadvantages as well as the safety of ambulatory tonsillectomy. This article examines the safety and limitations of ambulatory tonsillectomy, and presents guidelines for patient selection, operative management and discharge criteria pertaining to tonsillectomy.

Safety

Mortality after tonsillectomy was generally reported to be 1 : 1800 to 1 : 15 000 in the 1960s. A large series from the Pittsburgh Eye and Ear Infirmary, however, documented no surgical or anaesthetic mortality after 35 000 cases[3]. In 1968, Chiang et al.[4] reported a series of 40 000 tonsillectomies performed on an ambulatory basis without a single death. They attributed their success to careful patient selection, thorough preoperative examination, good anaesthesia, and meticulous surgical technique. Patients suffering from allergic episodes were not operated upon during the pollen season. However, the prevalence of allergies has increased dramatically in the last 20 years. Many patients now have chronic allergic symptoms, regardless of the season. Therefore, it is difficult to apply this exclusion criterion today. Maniglia et al.[5] went one step further when they concluded from their study of 1428 cases that there is little benefit in keeping patients in the hospital for more than a few hours after surgery, if there is no evidence of any serious medical condition requiring postoperative hospitalization. Reiner et al.[6], after reviewing charts of 1000 consecutive patients who underwent tonsillectomy, concluded that surgery of the tonsils can be performed safely as an outpatient procedure, if the patients are carefully selected by surgeons. Thus, there is clear evidence that ambulatory tonsillectomy is a safe procedure in carefully selected patients.

Patient selection

Tonsillectomy may generally be scheduled as an ambulatory procedure unless the following preoperative factors exist[7]:

1. Patient under 3 years of age;
2. History of obstructive sleep apnoea;
3. Co-existing medical condition; or
4. Social limitations (e.g. patient living more than a one

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hour's drive from a hospital, inadequate postoperative adult supervision).

Age

Surgeons have traditionally been reluctant to perform even inpatient tonsillectomy on children younger than 3 years of age, due to a smaller margin of error in such children before significant blood loss and upper airway obstruction arise[8]. A study of 190 children younger than 3 years, however, led Berkowitz and Zalzal to conclude that the decision to perform tonsillectomy should be made without regard to the age of the patient, provided that surgery is carried out for appropriate indications and is performed in an appropriate institution[9]. Nevertheless, the suitability of such patients for outpatient tonsillectomy is controversial. Tom et al.[10] who studied postoperative complications of T&A in 223 children younger than 36 months of age recommended that tonsillectomy be planned as an inpatient procedure in this age group. Shott et al.[7] have also stated that patients under 3 years of age are inappropriate candidates for outpatient adenotonsillectomy because of potential postoperative airway complications. In contrast, Segal et al.[11] reported successfully performing ambulatory tonsillectomy in 211 patients between 1 and 5 years of age. Thus, age of the patient remains a debatable criterion for exclusion from ambulatory tonsillectomy.

Obstructive sleep apnoea

Although recurrent infection remains the predominant indication for T&A, obstructive sleep apnoea (OSA) accounts for an increasing percentage of these procedures[12]. Fifteen years ago infection was the sole indication (100% of cases) for T&A, whereas now 81% of T&A are performed due to infection and 19% due to obstruction[13]. We are more likely to encounter OSA in younger patients than older children.

OSA has been defined as at least 30 episodes of apnoea (cessation of airflow for greater than 10 sec duration) during a 7-hour period[14]. Others define it as repetitive episodes of complete inspiratory obstruction during sleep or prolonged partial upper airway obstruction leading to hypoxia or hypoventilation[15]. OSA is a functional upper airway obstruction, specifically induced by sleep. The obstruction occurs when the collapsing force of negative inspiratory pressures exceeds the dilating force of oropharyngeal muscular contraction. Chronic hypoxaemia secondary to obstruction often leads to pulmonary hypertension and may result in right heart failure or cor pulmonale[15].

The diagnosis of OSA is made by clinical examination and a combination of other approaches such as polysomnographic sleep evaluation, video fluoroscopy, or audio tape recording[16]. Polysomnographic analysis is performed by attaching electrodes to the scalp, abdomen, and legs to determine sleep stages, respiratory activity, electrocardiac activity, heart rate, and muscle tone. For the assessment of respiration, sensors are attached to determine air flow and respiratory effort. The flow of air can be measured by CO_2 sensors, thermistors, or thermicouples. Respiratory effort may also be determined by a bellows-type respiratory transducer or by electromyography of intercostal muscle activity.

Table 1. Planned admission following T or T&A

Obstructive sleep apnoea	52
Age	19
Associated medical problems	12
Peritonsillar abscess	7
Social circumstances	3
Distance from hospital	1
Total	94

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Table 2. Scheduled as outpatient procedure but subsequently admitted $n = 421$

Obstructive sleep apnoea	10
Social circumstances	8
Nausea/vomiting	7
Bleeding	4
Associated medical problems	3
Dysphagia	2
Increased temperature	1
Total	35

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Two major categories of children may be predisposed to OSA: (1) patients with decreased airway size due to malformations such as micrognathia, choanal atresia, Pierre Robin syndrome, enlarged tongue, or tonsillar-adenoid hypertrophy[15]; and (2) patients with neurologic or neuromuscular diseases. When enlarged adenoids or tonsils are the cause of OSA, the efficacy of T&A in the relief of OSA is well established[14].

Are patients with OSA suitable candidates for ambulatory tonsillectomy? The evidence is not clear. Shott et al.[10] believed that patients with a diagnosis of OSA were inappropriate candidates for outpatient surgery, because of the increased possibility of postoperative airway obstruction. However, Reiner et al.[6] did not observe any increased risk associated with outpatient tonsillectomy in patients with OSA. Until more data are available, it is essential to observe such patients closely in the post-anaesthesia care unit (PACU) and to hospitalize overnight those who exhibit moderate to severe obstruction. A history of OSA is the most common reason for both planned and unplanned postoperative admissions[7] (Tables 1 & 2). Some patients with severe OSA may even require admission to the intensive care unit postoperatively.

Associated medical conditions

Many complications encountered after adenotonsillar surgery are intrinsic to the patient's disease and overall

medical condition[17]. Richmond et al.[17] noted that 50% of the children with known haematologic disorders suffered postoperative bleeding, and that 80% of airway complications occurred in children with other significant medical problems. Each patient should be carefully evaluated to determine the severity of associated medical diseases before inpatient or outpatient tonsillectomy is performed.

Social factors

Shott et al.[8] believe that special social circumstances such as poor access to follow-up health care, poor parental reliability, or the absence of a car or phone are all valid reasons for postoperative inpatient observation. Patients who live more than a one hour's drive from a hospital have also been thought to be unsuitable for ambulatory tonsillectomy. This arbitrary guideline is established so that patients can get prompt medical attention in the event of postoperative bleeding. There must also be adequate adult supervision at home to ensure that complications are detected early and medical attention is sought.

Operative management

Preoperative sedation may be required for anxious children. Anaesthetic techniques vary; however, a combination of inhalational and narcotic anaesthetic seems to be ideal for patients without obstruction. Recently propofol, in combination with narcotics, N_2O, or muscle relaxants, has also been used. Due to the risk of severe apnoea, only after careful consideration should narcotics be used in patients with OSA. Local infiltration of bupivacaine hydrochloride 0.25% and epinephrine 1 : 200 000 prior to tonsillectomy reduces operative blood loss but does not decrease postoperative pain or analgesic requirements in children[18]. In healthy children without obstruction, the choice of deep *vs.* awake extubation is based on the anaesthesiologist's preference[19]. The trachea of the child with OSA must be extubated only after the patient is fully awake and breathing adequately. Meticulous attention should be paid to all bleeding points.

Postoperative course

The most common complications associated with tonsillectomy are airway obstruction, pain, vomiting, and bleeding. Airway obstruction may become evident following extubation or in the PACU. Patients with OSA may not manifest any signs of obstruction while awake but may exhibit severe obstruction with apnoea while sleeping.

Almost all patients require narcotics to control pain in the postoperative period. Following an initial intravenous narcotic administration, they usually can be managed with 15 mg kg^{-1} acetaminophen. The benefits of nonsteroidal anti-inflammatory agents such as ketorolac in the management of post-tonsillectomy pain in patients with OSA has not been evaluated.

The incidence of vomiting following tonsillectomy is as high as 55%[17]. Although most patients do not require antiemetic medication, protracted vomiting must be treated before discharge from the surgical centre. Metoclopramide 0.15–0.25 mg kg^{-1} up to 10 mg i.v. or droperidol 50–75 μg kg^{-1} i.v. is effective in controlling postoperative vomiting; however, such large doses of droperidol may delay discharge[20]. Patients may not be able to retain fluids up to 24 hours postoperatively, making it imperative to ascertain that they are well hydrated before discharge. All patients must receive a minimum of 6–8 hours of fluid requirement before discharge. A prospective analysis of recovery following tonsillectomy demonstrated that oral fluid intake is similar in both ambulatory and inpatients[21]. The total (oral and intravenous) fluid intake was higher in patients who had been admitted overnight to the hospital, because of the continuous overnight intravenous fluid administration[21]. Hydration status, as judged by the amount of urine output, was similar in both groups of patients. Pain scores were also comparable in both groups of patients, indicating that all patients experienced the same degree of discomfort. Inpatients received less analgesics than ambulatory patients, even though pain scores were comparable in both groups[21].

How long should patients be observed in the surgical facility following tonsillectomy? The overwhelming reason to observe post-tonsillectomy patients after the first 2 hours would be to detect bleeding. The incidence of post-tonsillectomy bleeding ranges from 0.28 to 7%[5,6,11,22,23]. Such bleeding is classified as primary (within 24 hours of surgery) or secondary (24 hours after surgery). Even overnight admission will not detect secondary bleeding, which typically occurs between three and 10 days following surgery. The practical question therefore is: how long should patients be institutionalized following ambulatory tonsillectomy to detect most cases of primary bleeding? Crysdale and Russel[24] reported that 76% of primary haemorrhages occur in the first 6 hours following surgery. Carithers et al.[25] observed that 41% of primary bleeding occurred within 4 hours, 74% within eight hours, and 100% within 11 hours after surgery. Guida and Mattucia[26] observed 1000 patients who had undergone T&A and concluded that the greatest percentage of complications occur within the first 6 hours. They concluded that ambulatory T&A patients should be observed for at least 6 hours before discharge[26]. Carithers et al.[25] studied postoperative complications, including bleeding and emesis in an effort to identify significant predictors of complications. To hold the incidence of subsequent complications below 10%, they concluded that only 19.0% of the patients could be released after 4 hours. Of the remaining patients, 85.9% could be released after 8 hours, and 98.2% could be released 10 hours following surgery.

Conclusion

The decision to perform T&A surgery as an outpatient procedure is a matter of professional judgement. If a

decision is made to perform surgery on an ambulatory basis, the following guidelines are recommended[7,26].

1. Patients must be carefully selected to identify those with underlying medical disorders. Evaluation of the child's social situation and preoperative parental counselling will help ensure postoperative safety.
2. Careful attention should be paid to haemostasis, hydration, and analgesic requirements during the perioperative period.
3. All patients should be monitored in the recovery unit by skilled personnel for a minimum of 4–6 hours.

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Three years of institutionalized paediatric day case surgery: organization – indications – frequency – complications

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In the last seven years, the number of surgical procedures which are performed as day case surgery for infants and children has increased dramatically. Day case surgery should be able to be conducted effectively, with few complications, while saving time and money but also providing a pleasant atmosphere for the children and their parents. Since 1990, we have been practising day case surgery in the Department of Paediatric Surgery at the University of Tübingen twice a week. We have a special unit for this purpose with a team of day care personnel, paediatric nurses, anaesthesiologists and paediatric surgeons. The total number of operations performed in our department from 1990 to 1992 was 5330. Of these, 2111 (39.6%) were conducted as day case surgery for children of the ages six weeks to 20 years. The series includes 44 umbilical hernias, 385 phimoses, nine cervical cysts, 399 inguinal testes, 857 inguinal hernias, 90 hydroceles/funiculoceles, 19 haemangiomas, 43 meatotomies, 95 endoscopies and 170 other operations. Postoperative complications were defined as secondary haemorrhage, fever, obvious vomiting and urine retention. In a total of 35 (1.66%) children, the complications necessitated a stay in the hospital of up to eight (average 2.17) days, despite day case planning of the surgical procedure. Our experience shows that a large number of paediatric surgical procedures can be performed as day case surgery. Nevertheless, even with an expanded spectrum of possible operations there must always be ward capacities available in order to monitor and treat complications adequately.

Key words: Paediatric day case surgery, organization, indications, frequency, complications

Introduction

The number of operations in childhood that are planned as day case surgery has increased considerably in the past seven years[1,7]. The requirements for performing surgery in this manner are often fulfilled by infants and children, namely the classification as ASA Groups I and II, as well as minimally invasive operations which are not very time-consuming. The advantages of day case surgery include substantial reduction in costs as well as avoiding the separation of the child from their family in the pre- and postoperative phases[2,3]. A few hours after general anaesthesia has worn off, the children can leave the hospital to return home with their parents. Day case surgery should be able to be performed effectively, with minimal complications, and economically in a reasonably short amount of time. It should also take place in an atmosphere that is pleasant for the children and their parents. We have been conducting day case surgery since 1990 in the Department of Paediatric Surgery at the University of Tübingen on two week days. We have a unit specially equipped for this purpose with a team of kindergarten teachers, paediatric nurses, anaesthesiologists and paediatric surgeons.

Patients and methods

This prospective investigation includes all infants older than 6 weeks as well as all children for whom surgery was planned as day case surgery in the period from 1990 to 1992 in the Department of Paediatric Surgery of the University of Tübingen. The indication for surgery was established by preliminary examination in our clinic, at which time surgery was scheduled and anaesthesia examination performed. In addition, the parents received

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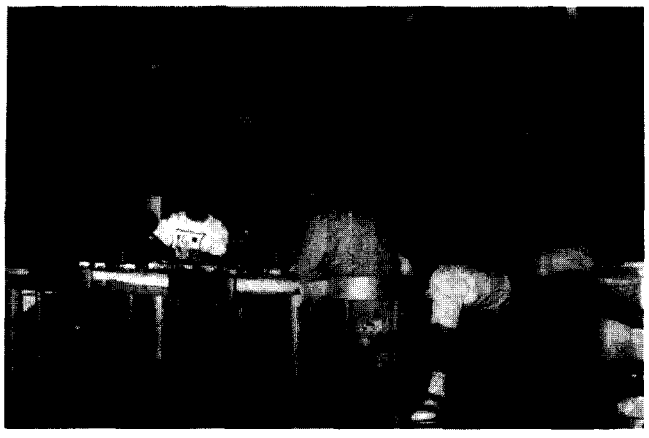

Figure 1. Playroom.

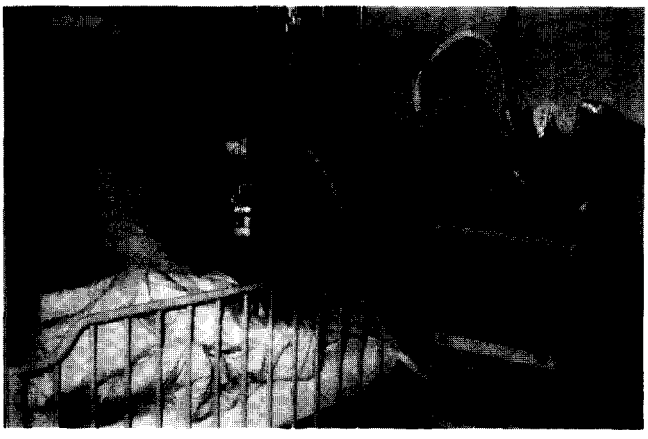

Figure 3. Recovery room.

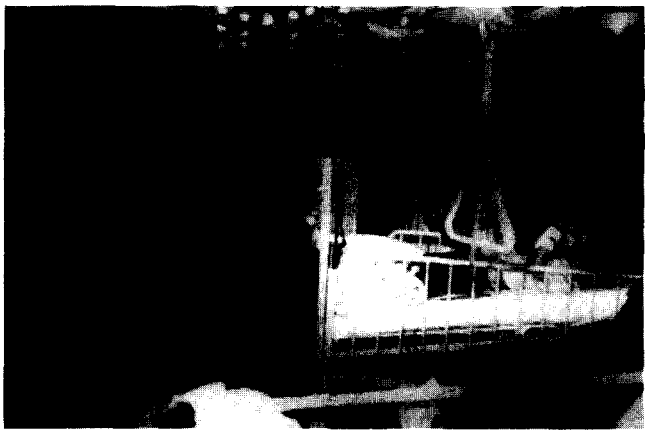

Figure 2. Playroom.

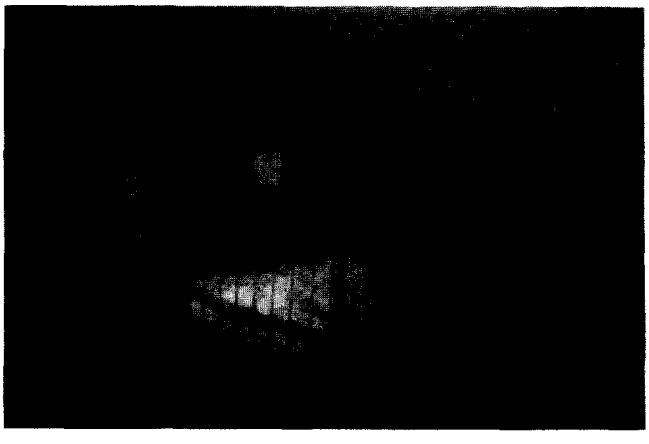

Figure 4. Ward.

detailed written information on the course of events on the day of surgery.

All children and infants were re-examined in our clinic on the morning of scheduled surgery and the parents had another opportunity to ask detailed questions about the operation or anaesthesia. At this time the infants and children were in a fasting state. They could pass the time waiting for surgery in the playroom with their parents, the kindergarten teachers and inpatients (Figures 1 and 2).

Twenty minutes before the children were scheduled in the operating room, all who were older than 1 year received oral premedication (midazolam, 0.4 mg kg^{-1} bw^{-1}). Surgery was conducted under halothane-N_2O anaesthesia after mask induction. The infants and children were brought into the recovery room after surgery, where they could be observed in the presence of their parents until transfer to the ward (Figure 3). On the ward they continued to be observed regularly. They were finally released 4–6 hours after surgery as long as no complications had occurred (Figure 4).

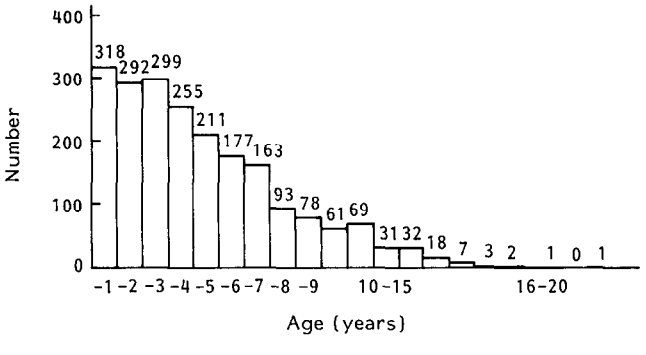

Figure 5. Age at the time of surgery.

Results

The total number of operations performed in our department from 1990 to 1992 was 5330. Of these, 2111 (39.6%) were planned as day case surgery for infants and children of ages six weeks to 20 years (Figure 5); 1666 were male and 445 female (3.7 : 1) (Figure 6).

The series includes 44 umbilical hernias, 385 phimoses,

Figure 6. Distribution of gender. Female : male = 1 : 3.7; n = 2111.

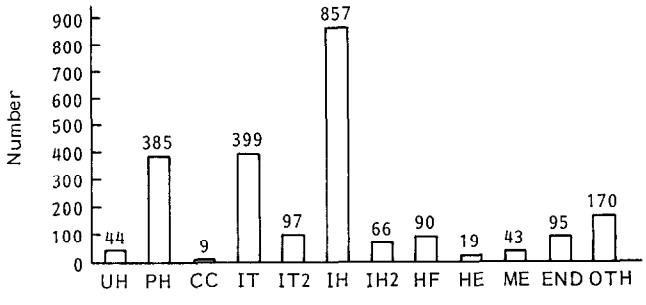

Figure 7. Diagnosis/operations. UH = umbilical hernia; PH = phimoses; CC = cervical cysts/fistula; IT = inguinal testes; IT2 = bilateral inguinal testes; IH = inguinal hernia; IH2 = bilateral inguinal hernia; HF = hydroceles/funiculoceles; HE = haemangioma; ME = meatotomy; END = endoscopy; OTH = other operations.

nine cervical cysts and fistulas, 399 inguinal testes (97 of these bilateral), 857 inguinal hernias (66 of these bilateral), 90 hydroceles/funiculoceles, 19 haemangiomas, 43 meatotomies, 95 endoscopies, and 170 other operations (Figure 7). Table 1 gives an overview of the 170 other operations.

Postoperative complications were defined as secondary haemorrhage, fever, vomiting, urine retention and laryngospasm upon terminating anaesthesia. Occurrence of such complications necessitated a stay in the hospital of up to 8 days (average 2.17 days) despite planned day case surgery for a total of 35 (1.66%) infants and children. The most common complication, observed in 17 children, was repeated postoperative vomiting. Secondary haemorrhage made a change to inpatient status necessary in five cases. Postoperative fever of up to 39.5°C occurred in seven children and three experienced postoperative urine retention. Three children were observed for an additional 24 or 48 hours, respectively, due to the occurrence of laryngospasm as anaesthesia was terminated and postoperative vomiting (Table 2).

Table 1. Other operations

Diagnosis	*Type of operation*	*No.*
Small soft tissue tumours	Extirpation	83
Susp. Hirschsprung's disease	Suction biopsy of rectum	23
Snapping thumb	Incision of annular ligament	14
Ingrown toenail	Emmet's operation	10
Neurogenic bladder	Suprapubic drainage	1
Foreign body	Removal	7
Shortened frenulum of tongue	Separation	12
Lymphoma	Biopsy of lymph node	12
Agenesis of testis	Prosthetic testis	1
Port/Hickman catheter	Catheter removal	7

Table 2. Complications

Complication	*No.*
Vomiting	17
Secondary haemorrhage	5
Postoperative fever	7
Urine retention	3
Laryngospasm, vomiting	3

n = 35 (1.66%)

Discussion

Our experience shows that day case surgery can be performed as of the sixth week of life for normally developed infants. Younger infants and those who were born prematurely have potentially immature organs, thus entailing possible complications such as delayed metabolism of inhalative anaesthetics or sleep apnoea. Therefore, a postoperative observation period of at least 24 hours with monitoring of pulse, blood pressure, respiration and blood sugar is mandatory for these patients, thus excluding them from day case surgery.

Day case surgery certainly offers an economic alternative in these times of ever-increasing costs in the health sector. The children, their parents and the physicians involved are generally enthusiastic, yet this fact has not been adequately acknowledged by health insurance agencies or politicians[1,4,5]. Another advantage of day case surgery is of a psychological nature. There is little probability that children involved will develop behaviour disorders of the kind seen in children who are hospitalized longer[6]. On the other hand, after the infants and children are released from the hospital, further observation and pain therapy are left in the parents' hands. This requires detailed instruction and information for the parents with respect to administration of pain medication and to possible complications at home. Despite planning day case surgery, 35 (1.66%) of our infants and children experienced complications which demanded an inpatient stay of up to 8 days (average 2.17).

In summary, our experience shows that a large number

of paediatric surgical procedures can be performed as day case surgery. Nevertheless, with such a widened spectrum one must be prepared for the occurrence of complications and always have capacities free for inpatient care where they can be observed and treated adequately.

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Oral and maxillofacial day case surgery in general anaesthesia with nasoendotracheal intubation

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In a prospective observation study we have evaluated whether some oromaxillofacial surgery using general anaesthesia with nasoendotracheal intubation can be performed as day case surgery. Patients received no premedication except for acetaminophen treatment from the evening before surgery. Anaesthesia was instituted with propofol, alfentanil, N_2O/O_2 2 : 1 and atracurium. All patients were nasoendotracheally intubated. Local analgesics were used to decrease the anaesthetic requirements and to provide postoperative pain relief. The patients received naproxene for postoperative pain treatment. Ninety-three patients with a mean age of 27 (4–83) were treated. The mean duration of surgery was 54 min (12–135). Except for postoperative sore throat (29%) and nose bleed (3%) no complications of intubation were seen. Eighty-seven (94%) patients were discharged after a mean of 5 h 40 min (2½–9½ h). Six patients were admitted due to nausea and vomiting (2), sudden anxiety of discharge (2), surgical complication (1) and more extensive surgery than expected (1). Ninety-four per cent of the patients were satisfied with the postoperative pain treatment and 92% would prefer day case surgery again. A wide range of oromaxillofacial surgical procedures can be performed safely under general anaesthesia with nasoendotracheal intubation as day case surgery.

Key words: Day case surgery, oromaxillofacial surgery, nasoendotracheal intubation, postoperative pain treatment, complications

Since the late sixties day case surgery has become more predominant, now accounting for approximately 50% of the surgical procedures done in the United States and 20–30% in the UK[1,2]. Initially a typical day case operation should not exceed 30 min, but the success of day case surgery has encouraged people to perform more prolonged operations; some centres now accept procedures lasting up to 3 hours as day cases[2,3]. The duration of surgery is, however, only one among a number of variables which must be considered before new procedures can be accepted for day case surgery. Other variables to be considered are expected blood loss, the physiological status of the patient, the risk of nausea and vomiting, expected level of pain postoperatively and the risk of airway compromise. Anaesthesia for oral and maxillofacial day case surgery involves several of these problems, of which the maintenance of free airways per- and postoperatively is the most troublesome, especially as the patients have to be nasoendotracheally intubated for surgical reasons. Effective postoperative pain treatment and a low incidence of nausea and vomiting is also essential. In a prospective observation study we have investigated whether some oral and maxillofacial surgical procedures can be performed safely as day case surgery under general anaesthesia with nasoendotracheal intubation, with the above-mentioned variables in mind.

Table 1. Baseline variables with range of the patients

Number of patients	93
Female/male ratio	49/25
Patients < 18 years	19
Mean age in years	27 (4–83)

Materials

During a 6-month period a total of 93 patients were treated. The baseline variables of the patients are shown in Table 1 and the surgical procedures in Table 2.

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Table 2. Surgical procedures

	No.
Arthroscopy of the temporomandibular joint	35
Mandibular implant procedures	22
Removal of impacted teeth/tooth transplantation	18
Uncomplicated facial fractures*	10
Other procedures	8

*Fractures of zygomatic bone, mandibular arch or orbital floor. (N = 93).

Table 3. Flowsheet on the day of day case surgery

	Hours . minutes	
Induction time of anaesthesia	0.18	(0.07–0.50)
Duration of surgery	0.54	(0.12–2.15)
Time before extubation	0.06	(0.01–0.20)
Observation on postoperative care unit	1.16	(0.15–3.28)
Total time spent before discharge	5.40	(2.30–9.30)

Methods

All patients were preoperatively evaluated by one of the participating anaesthesiologists and found to be in ASA group I or II. The patients were informed verbally and written consents were obtained. One gram acetaminophen was taken the evening before surgery and in the morning on the day of surgery. No other premedication was used. Children had EMLA (Astra) on the back of the hands one hour before surgery. On the day of operation a flow sheet showing the time consumption of each step of the treatment was filled in. All patients were recalled for control within three days of surgery, at which time they delivered an evaluation scheme.

Anaesthesia and postoperative care

All patients were monitored with ECG, non-invasive blood pressure, pulsoxymetry and most also with end-tidal CO_2. Anaesthesia was induced and maintained with propofol, alfentanil and N_2O/O_2 2 : 1. Neuromuscular blockade was achieved with atracurium. All patients were nasoendotracheally intubated and had a moist posterior pharyngeal pack placed. Before extubation the neuromuscular block was reversed with atropine/neostigmine. Lidocaine 1% local analgesic with epinephrine 5 μg ml^{-1} was used for infiltration into the surgical site and regional blocks before the start of the operation. At the end of the operation further regional and infiltrative injections of bupivacaine 0.5% were given for postoperative pain relief. Postoperative pain treatment was continued with acetaminophen and naproxen. From the operating theatre the patients were transferred to the postoperative care unit. When stable vital signs, minimal nausea, pain or bleeding were present and the patient was able to retain oral fluids, the patients were transferred to the surgical ward. Finally they were discharged when able to void, walk and dress without assistance and the accompanying person had arrived.

Results

The anaesthetic monitoring and induction time, the duration of the operation including surgical preparation time, time before extubation, the observation time on the postoperative care unit and the time to discharge are shown in Table 3. Eighty-seven (94%) of the patients were discharged. Six patients were admitted due to nausea and vomiting (2), anxiety of discharge (2), surgical complication (1) and undergoing more extensive surgery than expected (1). The correlation between the duration of surgery and the duration of postoperative care gave a correlation coefficient R = 0.28, but the correlation was significant ($P < 0.02$).

Table 4. Postoperative complaints among 75% of the patients.

Complaints	*No.* (%)
Muscle pain	16 (19)
Sleepiness	41 (49)
Headache	27 (32)
Nausea	17 (20)
Vomiting	8 (10)
Sore throat	24 (29)
Nose bleed	3 (3)
Wound bleed	2 (2)

Some patients had more than one complaint.

Patient's own evaluation of their day case surgery

Eighty-four (90%) of the patients delivered their evaluation scheme. Evaluation of pain treatment at the hospital showed that 82 of the patients (98%) were satisfied. Eighty-one (96%) found the pain treatment at home satisfactory, although six had experienced strong pain, 20 moderate pain, 32 slight pain and 20 no pain. Six patients did not answer this question. Sixty-three patients (75%) had one or more of the postoperative complaints shown in Table 4. Other less frequent symptoms included hoarseness (2 patients), ear pain (3) and a numb tooth (2). Three patients (4%) contacted the local primary health centre; one due to strong pain, one because of fever and one because of a numb chin. Seventy-seven (92%) responded that they would prefer day case surgery another time if possible. Seven patients would not prefer day case surgery on another occasion because they had had fever (1), vomiting (1), pain (1), dizziness (2) and too long transportation time home (170 km) (1). One patient did not give any explanation.

Discussion

The social and economic benefits of day case surgery are evident. Patients avoid an unnecessary hospital stay, have minimal disruption of daily routine and the hospital does not incur hotel costs[2]. The success of day case

surgery demands high standards of care, because it is essential that there is a minimum of postoperative sequelae, as the patient must be 'street fit' within a few hours.

In this observation study we have evaluated whether some oral and maxillofacial operations could be performed on a day case basis. For surgical reasons most patients having oral and maxillofacial surgery must be nasoendotracheally intubated with the possibility of complications such as epistaxis, trauma to the posterior pharyngeal wall, dislodgement of the adenoids, auditory tube obstruction, maxillary sinusitis and bacteraemia. To our knowledge only two papers have reported on complications or complaints in day cases undergoing oral and maxillofacial surgery using general anaesthesia with nasoendotracheal intubation. One paper, however, has dealt with orthognathic procedures performed over a nine-year period in 87 patients in an outpatient environment. All the patients had been nasoendotracheally intubated. Fourteen of the patients (16%) were admitted to hospital requiring observation of the airway, severe nausea or vomiting, significant blood loss or pain[4]. The surgical procedures performed in the study were, however, more advanced than in our study, which may explain the higher admission rate. The other paper compared the use of a reinforced laryngeal mask with nasoendotracheal intubation in dental surgery. The study reported no difference in visual analogue score of complaints among the 30 patients in each group, except for a higher score of muscle pain in the nasoendotracheally intubated group[5]. The use of suxamethonium for intubation of the patients in this group may explain this difference. Three patients all from the nasoendotracheally intubated group were admitted due to excessive bleeding.

Usually a tube with i.d. 7.0 mm is recommended for nasoendotracheal intubation of adults[6]. We have tried to reduce the complication rate due to nasoendotracheal intubation by using tubes with a smaller internal diameter and with a maximum size of i.d. 6.0 mm in adults. As all patients were on controlled ventilation, we did not observe any signs of hypoventilation. Where end-tidal CO_2 was monitored, this parameter was within normal range. The nose bleed in three patients after their discharge may be due to the nasoendotracheal intubation. The incidence of sore throat in 29% and hoarseness in 2% are low compared with symptoms in inpatients following orotracheal intubation[7]. None of these symptoms resulted in admission or a visit to the general practitioners. Based on our own findings in this study, it seems that patients who have been nasoendotracheally intubated can be handled safely as day case patients.

The use of propofol, alfentanil and atracurium for anaesthesia in day case surgery seems to be the best choice today[8-11]. Propofol and alfentanil are well tolerated, have a rapid elimination and are associated with a low frequency of postoperative nausea and vomiting. Indeed propofol seems to possess an anti-emetic action in low doses[12]. In our study the patients were extubated within a mean of 6 min (1–20) after the end of surgery and 20% had nausea and 10% did vomit. These are low incidences[13]. The combination of fast recovery and low incidence of nausea and vomiting is extremely important in day case patients operated on in their oral cavity.

Several studies have shown that pain treatment with a nonsteroidal anti-inflammatory drug (NSAID) or acetaminophen started preoperatively reduces the postoperative need for opioids in various types of operations[14-17]. The combined action of acetaminophen and a NSAID on pain relief has not been studied. Oral administration of most NSAIDs inhibits platelet aggregation, whereas acetaminophen does not inhibit platelet aggregation to the same extent[18]. To avoid the inhibition of platelet aggregation and to reduce the postoperative use of opioids we started only the acetaminophen treatment preoperatively and then supplemented with naproxen postoperatively.

Clinical studies have shown that postoperative pain is reduced if regional anaesthesia or incisional local analgesia is used[19,20]. We used nerve blocks and/or infiltrational local analgesia with lidocaine before surgery because of the fast onset. At the end of surgery additonal local analgesia was given using bupivacaine to ensure long lasting pain relief. This combined regime with acetamimophen, naproxen and local analgesia gave good pain relief and no opioid was used. Eighty-one of the patients (96%) evaluated their pain treatment as satisfactory although 31% graduated their pain intensity to be strong (7%) or moderate (24%). These last numbers indicate that the postoperative pain treatment still might be improved. An admittance rate of 6% is acceptable taking surgical procedures into consideration. The poor correlation between the duration of surgery and the duration of postoperative care indicates that the duration of surgery per se is not a limiting factor to day case surgery.

In conclusion, some oromaxillofacial surgical procedures can be performed safely as day cases under general anaesthesia with nasoendotracheal intubation, if a fast recovery, a low incidence of nausea and vomiting and effective pain treatment can be accomplished.

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Blood glucose and propofol in outpatient anaesthesia

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The authors report on their experience with propofol during outpatient anaesthesia for gastrointestinal endoscopy (colonoscopy), where patients recovering from anaesthesia with propofol spontaneously expressed an intense feeling of hunger. The prospective randomized trial involved two homogeneous groups of 60 patients and showed that this was not due to blood glucose variations but rather to central and perhaps limbic effects, similar to states of excitation or inhibition sometimes noted. This effect should not be considered as an adverse reaction to propofol.

Key words: Outpatient, propofol, 'hunger pangs', central disinhibition

Propofol is currently the first-line reference drug in numerous areas of anaesthesiology, including that of outpatient anaesthesia. Among other reasons, this is due to its short duration of action, excellent quality of recovery from anaesthesia, and rapid return of normal ability to cope with daily life.

Since the introduction of propofol into our protocols for outpatient anaesthesia during non-surgical gastrointestinal endoscopy, it was noted that patients experienced an intense feeling of hunger without any objective clinical signs of hypoglycaemia during recovery. Moreover, the carbohydrate metabolism of these patients was not defective. On the basis of this observation, we felt it would be appropriate to carry out a prospective, randomized study of the blood glucose variation induced by propofol in a well-defined category of patients who had to undergo total colonoscopy. The study was undertaken after approval by the Ethics Committee of our hospital.

Equipment and methods

Sixty patients were randomized into two groups, GI and GII (Table 1). Obese or undernourished patients or those presenting with, or having presented with, defective carboyhydrate metabolism were excluded.

The two groups, GI and GII, were strictly identical in terms of ASA, height and weight, and distribution according to sex and age. Preparation for colonoscopy and the duration of the fasting period before the examination were similar for the 60 patients.

Table 1. Comparison of characteristics of patients in GI and GII

	Group I (n = 30)	*Group II (n = 30)*
ASA	1.5 ± 0.68	1.6 ± 0.55
Height (m)	1.65 ± 0.08	1.64 ± 0.08
Weight (kg)	59.06 ± 9.5	61.4 ± 9.4

Statistical comparison of blood glucose levels was made by analysis of variance.

Anaesthetic technique

Anaesthesia was induced intravenously with spontaneous ventilation of air/oxygen (50 : 50) using a mask. Infusion of a 0.9% solution of NaCl was used and patients were monitored by electrocardiogram for heart rate; systolic, diastolic and mean blood pressure; and pulsed oxygen saturation. Group I received midazolam and alfentanil, whereas Group II received propofol and alfentanil, see Table 2.

Study of blood glucose variation

Blood glucose was measured for all 60 patients at the following times: T0 = Reference blood glucose upon admission; T1 = Blood glucose after induction of anaesthesia; T2 = Blood glucose at the end of colonoscopy, upon arrival in the postoperative recovery room, see Table 3. There was no statistically significant difference in the blood glucose within a given group at T0, T1 and

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Table 2. Anaesthetic agents used

Group I (n = 30)	
Midazolam	0.06–0.1 mg kg^{-1}
Alfentanil	15–20 μg kg^{-1}
Group II (n = 30)	
Propofol	2–3 mg kg^{-1}
Alfentanil	15–20 μg kg^{-1}

Table 3. Blood glucose variation between GI and GII (mean ± standard deviation)

	Group I (n = 30)	*Group II (n = 30)*
T0	4.93 ± 0.67 mmol l^{-1}	4.89 ± 0.94 mmol l^{-1}
T1	4.73 ± 1 mmol l^{-1}	5.02 ± 0.38 mmol l^{-1}
T2	4.95 ± 0.65 mmol l^{-1}	4.94 ± 0.51 mmol l^{-1}
Δ T0–T1	1440 min	1440 min
Δ T1–T2	103 ± 43 min	91 ± 12 min

T2, or between groups GI and GII. At the end of the procedure, no hypoglycemia was detected.

Conclusion

The intense feeling of hunger expressed by patients anaesthetized with propofol for a non-surgical procedure does not appear to be attributable to hypoglycaemia, however transient. We feel it reasonable to assume that metabolism is not involved in this reaction: it is most probably central in origin during the immediate post-anaesthetic phase, in the same way as certain states of euphoria and disinhibition (especially sexual disinhibition) already described. These 'hunger pangs' are easily appeased by the absorption of slow sugar and of coffee or tea (with or without sugar) and do not reappear in the immediate (within 24 or 36 hours) postanaesthesia period.

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Erratum

Twersky RS. To be an outpatient, or not to be — selecting the right patients for ambulatory surgery. *Ambulatory Surg* 1993; **1**: 5–14

The caption to Figure 1 should have read as follows.

Hospital-based surgeries; inpatient versus outpatient (source: American Hospital Association Survey 1980–1990).

We apologize for any inconvenience caused.

Ambulatory Surgery 1993; **1**: 103–105

Five years' experience of oral day surgery

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Many oral surgical cases are ideal for management on a day case basis. The Manchester Royal Infirmary Oral Surgery Day Case Unit was opened in July 1987 and has been instrumental in reducing inpatient waiting lists and improving facilities for teaching undergraduate and postgraduate students. The rapid turnover of patients has improved facilities for research, and nurse education and development have been fundamental to the development of the Unit. Patient feedback has been very positive and the Unit has proved to be an important part of the wider service offered by a busy Oral and Maxillofacial Department.

Key words: Oral surgery, day surgery

A significant number of dental or oral surgical procedures have been undertaken as day cases for many years, most of which being minor procedures under sedation with local analgesia or simple dental extractions under general anaesthesia. Developments mainly in anaesthetic techniques and drugs have made it possible to extend the range of surgery to include dento-alveolar procedures.

The Manchester Royal Infirmary Oral Surgery Day Case Unit opened in July 1987 with a number of aims, the principal ones being to reduce inpatient waiting lists, promote nursing education and development and to improve facilities for research.

The concentration of selected patients requiring routine procedures into the day case unit has provided an environment where these objectives have been achieved.

Effect on waiting lists

Over 70% of patients requiring a general anaesthetic can now be treated as day case. Of these 72% of cases consist of removal of third molars.

For most surgical treatment the patients wait on extensive lists which do not reduce in length. Day case surgery in Manchester has had a considerable effect on the length of inpatient waiting lists for routine procedures since the unit provided an 'alternative channel' and not a substitute for inpatient care[1].

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The waiting list in the Department of Oral and Maxillofacial Surgery in Manchester in September 1984 was just over 400 cases. In September 1985, after a rigorous validation of the list which resulted in the removal of over 50 cases, the number remained at 403. In reality this indicated that the waiting list was increasing. During this validation it was revealed that patients suitable for day-case management constituted 45% of the inpatient waiting list (about 180 of the cases awaiting admission at that time). The rate of admission of this group of patients was slow due to the high referral and admission of patients requiring complex oral and maxillofacial procedures, e.g. correction of facial deformities, head and neck cancer surgery.

Figure 1 represents the inpatient waiting lists from September 1984 to September 1992 which increased during 1985 and 1986 and reached a peak in July 1987, which co-incidentally was the month in which the day case facility opened. Since that time there has been a steady reduction in the numbers of patients waiting for routine types of oral surgery procedures.

By September 1992, the number of patients awaiting inpatient surgery had dropped to about 160. It was also noted that the patients remaining on the inpatient list are those for whom an overnight hospital bed is essential either because of the nature of the surgery or because of social circumstances.

The range of procedures undertaken on the Unit, ranging from dental extractions to the correction of nasal and malar fractures is as follows.

(1) Excision of uncomplicated impacted teeth and buried roots.
(2) Exposure of unerupted teeth for orthodontic treatment.

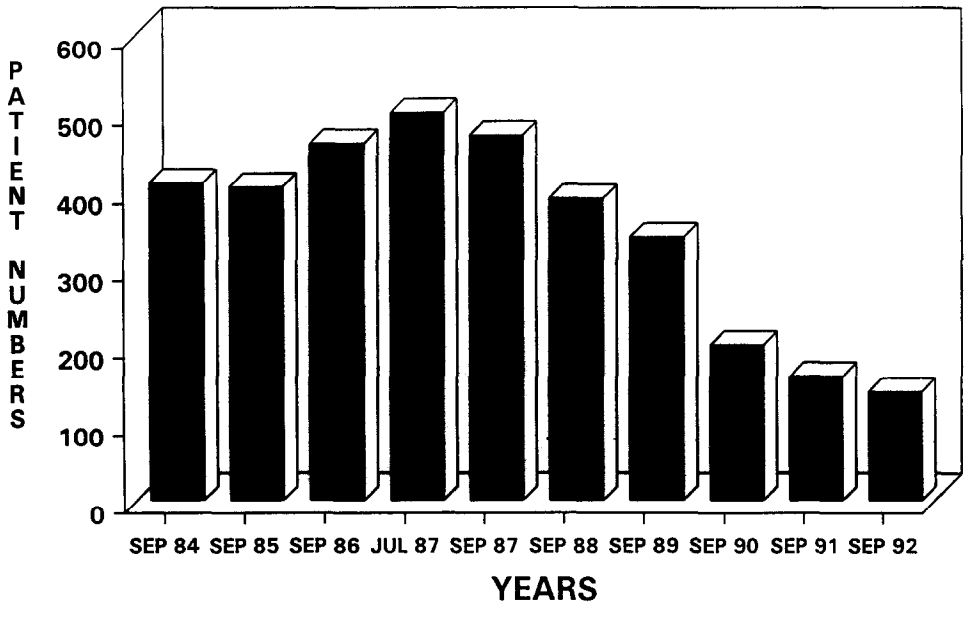

Figure 1. Changes in inpatient waiting list from September 1984 to September 1992.

(3) Biopsy of hard and soft tissues.
(4) Enucleation of small cysts.
(5) Division of pedicles.
(6) Removal of bone plates and wires.
(7) Minor soft tissue surgery.
(8) EUA for suspected malignancy.
(9) Cryo-blockade of peripheral nerves.
(10) Laser and cryo-surgery of small lesions.
(11) Reduction of nasal and malar fractures.
(12) TMJ anthroscopy.
(13) Salivary ductoplasty and removal of calculi.

Teaching development

The concentration of those patients requiring dento-alveolar procedures into one area has allowed the development of a specific teaching module for undergraduates whereby their exposure to clinical surgery has been greatly increased. Early in their clinical training, students are allocated to teaching sessions on the Unit where they can acquire and practice simple clinical procedures such as monitoring of blood pressure and pulse and familiarize themselves with recovery and resuscitation procedures. Exposure to the 'live' clinical situation brings the student an added awareness of the importance of these clinical skills early in their training. During this course students are introduced to surgical procedures with the added advantage of being able to learn techniques on patients who are anaesthetized. Later in the course students attend the Day Case Unit regularly for further clinical surgical practice.

For the postgraduate junior oral surgery staff members the Day Case Unit offers a unique ability to operate regularly on a large number of patients requiring routine dento-alveolar surgery; this, together with the close supervision given by the senior surgeon on the list, allows a high degree of surgical skill to be developed in these basic techniques of oral surgery. Since students are attached to every operating list for the instruction, junior members of staff are encouraged to develop their teaching methods under supervision. Naturally the time invested in clinical teaching reduces the throughput, but this is accepted as an inevitable consequence of this valuable activity.

Research

A number of projects have been undertaken by both the clinical and nursing staff helped significantly by the rapid turnover of cases, many of which are of a similar nature (e.g. 72% of cases involved third molar surgery as mentioned earlier).

Projects which have been undertaken have been mainly in the areas of anaesthesia and analgesia, but have also included studies on nerve injury.

Promotion of nurse education and development

The nurses have always had a pivotal role within the unit, and are required to have a range of skills[2]. They have always made a major contribution to the assessment of patients prior to surgery and post surgery and are involved in patient preparation on the day of surgery itself. The nurses are also responsible for setting up theatre and assisting in the anaesthetic room. In all relevant areas the nursing staff have been made responsible for setting and maintaining standards and have regular audit meetings. Formal teaching is required to achieve the standard of nurse education required and senior nurses in the field have promoted the establishment of the nationally recognized course–ENB A21–to which it is hoped that this unit will be making a contribution.

As well as supporting clinical research, nursing

Table 1. Opinions of 200 patients on various aspects of the day case service; the questionnaire was presented in the form shown, with patients requested to tick the appropriate opinion of the various aspects

	Day Case Unit – quality rating				
	Excellent (%)	*Good* (%)	*Fair* (%)	*Poor* (%)	*Very poor* (%)
(1) Ease of parking*	0	14	18	30	28
(2) Overall attitude of clinician at original consultation, on the ward, and at review	72	28	0	0	0
(3) Overall attitude of the nursing staff at original consultation, on the ward and at review	18	58	24	0	0
(4) Attitude of other staff	24	74	2	0	0
(5) Adequacy/convenience of given operation date	58	36	4	2	0
(6) Care on the day case ward	50	40	8	2	0
(7) Privacy	38	36	18	6	2
(8) Adequacy of information	50	36	12	2	0
(9) Aftercare	20	42	36	2	0
(10) Adequacy of postoperative pain control	34	42	22	2	0
(11) Overall satisfaction	28	52	18	2	0

*Ten per cent of patients did not need to utilize a parking facility and question one was therefore not applicable

standards and policy have been research based, e.g. discharge criteria, knowledge of incidence and nature of postoperative morbidity and pain management.

Patients' opinions

Two questionnaires were distributed to patients who had undergone care in the Unit just after being formally discharged at the review appointment[3]. The questionnaires were based on similar documents designed by the Audit Commission in the UK for the evaluation of day case surgery[4,5]. Two hundred patients were chosen sequentially over a 3 month period. It was considered that 200 would be representative of opinion.

Questionnaire 1

Patients were generally satisfied with their overall experience of day surgery (80% rating the latter as excellent or good); see Table 1.

The biggest area of contention was the large number of people who were dissatisfied with facilities for parking – 58% rating this as poor or very poor. Hospital developments have since lead to an improvement in parking facilities. Dissatisfaction with the latter is important as difficulties can lead to lateness and failed appointments; this is also often the first experience the patient has of the hospital referral and frequently leads to frustration and increased anxiety.

Questionnaire 2

The second questionnaire (Table 2) was also distributed to the same group of patients to assess their attitudes to day case surgery in general. Less disruption to routine appeared to be the most popular reason for opting for day case surgery (35%). Fifteen per cent regarded the shorter waiting list as the most important factor.

Table 2. The factors patients considered to be the most important consideration with regard to day surgery, from the list provided; only one opinion was allowed.

	n	%
Less disruptive to routine	70	35.0
Prefer to recover at home	28	14.0
Shorter waiting list	30	15.0
Saves NHS costs	7	3.5
Insufficient medical/nursing care at home	4	2.0
Lack of adequate pain relief	20	10.0
Extra pressure on family routine	3	1.5
Lack of rest at home after operation	11	5.5
No disadvantages overall compared to other modes of treatment	27	13.5

$n = 200$

Conclusions

Looking to the future, it is hoped that in the next few months the Unit will no longer have to share facilities since it is planned that the unit will be housed in dedicated facilities. It is envisaged that both undergraduate and postgraduate teaching, together with nurse education, will be enhanced further.

In general terms the initial aims of the Oral Surgery Day Case Unit have been realized. The aim for the future must be to expand and develop on these achievements.

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Ambulatory Surgery 1993; **1**: 106–107

Literature review

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Should all children with suspected or confirmed malignant hyperthermia susceptibility be admitted after surgery? A 10-year review

Steven M Yentis, Mark F Levine, Elizabeth J Hartley

Anesth Analg 1992; **75**: 45–50

Children otherwise suitable for same-day discharge may be admitted to the hospital solely because they are known or suspected to be malignant hyperthermic-susceptible (MHS). An informal telephone survey of the anaesthesia departments of six major north American children's hospitals revealed that all six allow certain suspected MHS children to go home after minor surgery.

A retrospective review of the history, management and outcome of all suspected or proven MHS patients who presented for surgery within a 10-year period was done at the Hospital for Sick Children, Toronto, Canada, to ascertain the incidence of intra- and postoperative complications. No MH reactions occurred. None of the 25 children (33 cases) with biopsy-proven malignant hyperthermia developed intraoperative or postoperative pyrexia.

Ten children suspected to be MHS developed pyrexia > 38.5°C. These episodes were not considered to be malignant hyperthermia. On the basis of this retrospective review, the authors concluded that same-day discharge of MHS patients after uncomplicated ambulatory surgery is not likely to be associated with an MH event after discharge from hospital.

Comments
In the past, overnight hospitalization of suspected or confirmed MHS patients after surgery has been a common practice, even after minor surgery. This study indicated that intraoperative and postoperative complications are rare in patients labelled as MHS who undergo even prolonged surgery with trigger-free anaesthesia. The maximum risk of an MH reaction occurring, based on these data, is 1.6% with a 99% confidence level.

The number of confirmed MHS patients in this study is small, 25 patients undergoing 33 procedures. Therefore a prospective study is needed. The recommendation of this study is that ambulatory surgery can be performed in children who have suspected or confirmed MH susceptibility provided that they receive a trigger-free anaesthetic, the parents are well informed regarding MH and its signs, and medical care is immediately available within the local community.

FC

Should children drink before discharge from day surgery?

Mark S Schreiner, Susan C Nicolson, Thalia Martin, Lance Whitney

Anesthesiology 1992; **76**: 528–33

The ability to drink clear liquids without vomiting after anaesthesia and surgery is a commonly used criteria for discharge of paediatric day surgery patients. This study investigated whether drinking was a necessary criterion for discharge. Nine hundred and eighty-nine patients were randomized to one of two groups. The 464 'mandatory' drinkers were required to demonstrate the ability to drink clear liquids without vomiting prior to discharge from the hospital; whereas, 525 'elective drinkers' were allowed to be discharged but not required to drink.

In the day surgery unit, only 14% of the elective drinkers vomited compared to 23% of the mandatory drinker goup ($P < 0.001$). The mandatory drinkers had a more prolonged stay in the day surgical unit, averaging 101 ± 58 min compared to 84 ± 40 min for elective drinkers ($P < 0.001$). The authors concluded that it was unnecessary to make drinking a prerequisite for discharging paediatric patients after day surgery.

Comments
Nausea and vomiting is the most common medical reason requiring unanticipated hospital admission for children after day surgery procedures. Ensuring that the children can drink oral fluids before discharge can minimize the potential for readmission secondary to dehydration. However, requiring children to drink before discharge may precipitate vomiting in the postoperative period.

This is the first prospective study to determine whether drinking is a necessary criteria for discharge. The data indicated that requiring children to drink prior to hospital discharge appears to increase the incidence of vomiting, and prolong the duration of hospital stay. Therefore, children can be safely discharged after day surgery without making drinking a prerequisite. This can potentially shorten the duration of stay and nursing hours.

FC

Preadmission Anaesthesia Consultation Clinics

James B Conway, Jeff Goldberg, Frances Chung

Can J Anaesth 1992; **39**: 1051–7

In recent years, there has been a strong shift towards increased use of ambulatory surgery facilities, and a trend towards accep-

tance of more medically ill patients in these centres. Thus more patients are presenting for anaesthesia and surgery in these ambulatory facilities without formal preoperative anaesthetic assessment. These factors can result in surgical delays and cancellations. These problems may be resolved if anaesthetists are able to assess higher-risk patients on an ambulatory preadmission before surgery.

In this study, the authors studied the case referral pattern and efficiency of the anaesthesia consultation clinic. Data were collected prospectively on the first 400 patients referred to the clinic. The primary reason for referral was related to the cardiovascular system in 60% of cases, endocrine system in 13% of cases, respiratory system in 8% of cases, and the neurologic system in 5% of cases.

Overall, 81% of referrals were considered appropriate, and 19% were considered inappropriate. Thirty-five per cent of all patients were sent for additional testing, and 9% required consultations. When interviewed before discharge from hospital, 92% of patients felt that their anaesthetic consultation had contributed to better perioperative care. Ninety-two per cent felt that they were better informed, and 84% felt less anxious as a result of the preoperative consultation clinic visit. The authors concluded that the preadmission anaesthesia consultation clinic represented an effective means of evaluating higher risk, elective surgical patients.

Comments

The acceptance of older and more medically compromised patients as well as more extensive operations in ambulatory facilities may lead to an increased rate of operative delays and cancellations. The preadmission anaesthesia consultation clinic can improve patient care and minimize operative delays and cancellations through more thorough preoperative evaluation, and preparation of medically compromised patients, thus improving efficiency. It can improve patient satisfaction and comfort by providing maximum information to the patients in a relaxed setting. In addition, it can optimize communication between anaesthetist and surgeon regarding individual patient care. This represents a potentially important reduction in costs and improvement in operating room efficiency.

FC

Anaesthesia for gynaecological laparoscopy — a comparison between the laryngeal mask airway and tracheal intubation

DG Swann, H Spens, SA Edwards, RJ Chestnut

Anaesthesia 1993; **48**: 431–4

In a single-blind, randomized, controlled study, we compared two anaesthetic techniques in 60 patients undergoing gynaecological laparoscopy. In the first group, ventilation was controlled, after paralysis and tracheal intubation. In the second group, a laryngeal mask airway was inserted and spontaneous or assisted ventilation allowed. There were no clinically significant differences in the intra-operative conditions of the two groups, although the procedure was quicker in the second group. The only significant difference in mobidity was a greater incidence of nausea and vomiting in the second group in the first 4 h after operation. We conclude that use of the laryngeal mask airway is an acceptable technique for elective gynaecological laparoscopy, in patients who are at low risk of regurgitation.

Comments

Anaesthesia of only limited duration is necessary in ambulatory surgery. One might assume that a laryngeal mask airway is less traumatizing to the patient than tracheal intubation. This randomized comparison study does not show a significant difference for postoperative sore throat or hoarseness in either group. However, nausea and vomiting was seen significantly more after laryngeal mask airway anaesthesia. As the authors suggest in their discussion this might be due to gastric insufflation in the non-intubated group, and the administration of atropine at reversal of neuromuscular blockade in the intubated group to reverse neuromuscular blockade. The incidence of nausea and vomiting might reduce if nitrous oxide anaesthesia was not given.

From this study one might conclude that both anaesthesia techniques are comparable and have no preference in ambulatory surgery.

PG