Editorial

Ambulatory (day-care) surgery was first documented in 1909 when J H Nicoll reported to the British Medical Association successful results in 8988 children operated on as day cases at the Royal Hospital for Sick Children in Glasgow, for such conditions as phimosis, talipes, harelip, mastoid disease, hernias and undescended testicles. In the United States R M Waters opened the Down-Town Anaesthesia Clinic in Sioux City, Iowa for dental cases and minor surgery. Waters, in 1919, said "The future for such a venture, I believe, is bright".

The work of these pioneers was not followed by an immediate growth in ambulatory surgery. A marked expansion only began in the 1960s, most rapidly in North America and more slowly in Europe.

At the beginning of the last decade of the twentieth century 50% of surgery in the United States was performed on an ambulatory basis compared with between 15 and 20% in the United Kingdom. Worldwide there has been a growing but patchy interest in this form of treatment with countries such as Sweden, Canada, Australia and Denmark progressing rapidly, but others such as Germany and the old Eastern Bloc countries being slow to take up the concept.

Originally ambulatory surgery meant short procedures on physical status ASA 1 or 2 patients. The development of new anaesthetic agents and techniques, improved and minimally invasive surgery and new and newly formulated analgesics has allowed an expansion in the procedures suitable for ambulatory care, and the ability to treat some ASA 3 patients in this way.

Today in health care throughout the world there is a thrust towards quality care and cost containment. Ambulatory surgery meets these requirements. The majority of patients prefer this form of treatment as it lessens the psychological stress associated with hospitalization and they can recover in the familiar surroundings of their home. Ambulatory surgery is cost effective with savings, compared to inpatient surgery, estimated at between 15 and 80% depending on the procedure, the type of ambulatory unit and the country.

Ambulatory surgery can be described as patient care tailored to meet the needs of the 'non-sick'. As such it is being substituted for inpatient surgery in ever-increasing amounts.

By the end of this century the question will not be whether a patient is suitable for treatment on an ambulatory basis rather than as an inpatient, but whether there are any indications for admission for inpatient treatment.

Ambulatory Surgery will promote and develop this system of patient management by providing a multidisciplinary, international forum for all healthcare professionals involved in day-care surgery. The journal will publish peer-reviewed original articles relating to the practice of ambulatory surgery, including papers on the following topics: basic and clinical research (surgery, anaesthesia, nursing); administrative issues (facility development, management, policy issues, reimbursement); and perioperative care (patient and procedure selection, discharge criteria, home care, quality of care). *Ambulatory Surgery* will be the primary international journal for the publication of high-quality papers in this field.

Paul E M Jarrett
Bernard V Wetchler

Ambulatory Surgery 1993; **1**: 5–14

Review

To be an outpatient, or not to be — selecting the right patients for ambulatory surgery

R S Twersky

SUNY Health Science Center at Brooklyn, Brooklyn, New York, USA

Selecting the right patients for ambulatory surgery is an integral part of ensuring that quality of medical care is delivered in this setting. Outpatient surgery's exponential growth of the 1980s has spilled over into the last decade of this century, projecting that by the year 1995 over 60% of all elective surgery will be performed on an outpatient basis. Accordingly, we have witnessed the change in composition of ambulatory surgery patients. This article discusses the adaptation that physicians have made to meet the demands of the changing face of ambulatory surgery. Modes of preoperative screening and patient selection will be reviewed.

Key words: Ambulatory surgery, preoperative screening, patient selection

The growth of ambulatory surgery in the past decade has drastically changed the approach to the surgical patient. Admitting a patient for an elective surgical procedure a day or two before, and recovering him in the hospital appears to be a practice of the past, perhaps something to be found in the archives of surgery and anaesthesia. In fact over 50% of elective surgery in North America is currently performed on an outpatient basis with a projected increase to 60% by 1995.

While the concept of performing surgery in a short-stay facility or outside a hospital can find its historical origins as early as the turn of the 20th century[1,2], over 60 years had passed until outpatient surgical programmes had begun to integrate themselves into the scope of acceptable surgical and anaesthesia practice. In the early 1960s, outpatient surgical programmes were initiated at the University of California at Los Angeles and George Washington University in Washington, DC. In 1970 the first freestanding surgicentre facility was opened in Phoenix, Arizona by Drs Reed and Ford, two anaesthesiologists. In 1980, outpatient surgery accounted for a small fraction (16%) of total surgeries performed. Then, an explosive growth occurred. Figure 1 shows that hospital-based outpatient surgeries more than tripled during the 1980s from 3 million to 11 million in 1990. At the same time, inpatient surgeries dropped by over 31%. As a result, the annual number of outpatient surgeries exceeds the number of inpatient surgeries. A significant development in the last half of the 1980s was the growth of off-campus freestanding ambulatory surgery centres (FASCs). Hospital-owned ambulatory surgery centres (ASCs) physically separated from the hospital are also considered 'freestanding'. Because FASCs are physically separate from the hospital's emergency department and other back-up services, FASCs were limited in the types of surgeries that could be performed. Significant growth occurred in FASCs over the past 10 years due to the increase in Medicare-approved procedures for FASCs. While these procedures are a lower acuity than those performed in hospital outpatient surgical departments, the complexity of procedures that can be performed in FASCs is increasing. Of the 11 million ambulatory surgeries performed in 1990, approximately 3 million were performed in free-standing ambulatory surgery centres. A marketing survery projected that although there are currently over 1600 FASCs, by the end of 1993 there will be approximately 1708 freestanding surgery centre facilities in the United States, averaging over 2000 procedures per facility, thereby accounting for approximately 3.8 million outpatient procedures[3,4]. As a result, hospitals' share of the total number of outpatient surgeries declined, from more than 90% in 1985 to 83% in 1990 (Figure 2).

This development, fuelled by new technology, rapid- and short-acting new anaesthetics as well as changes in inpatient reimbursement, is one of the most dramatic changes in surgical care. Many of the most frequently performed surgical procedures have been or soon will be affected by new techniques that reduce the length of stay,

Accepted: January 1993
Correspondence and reprint requests to: Rebecca S Twersky, MD Department of Anesthesiology, Box 6, SUNY Health Science Center at Brooklyn, 450 Clarkson Avenue, Brooklyn, New York 11203, USA

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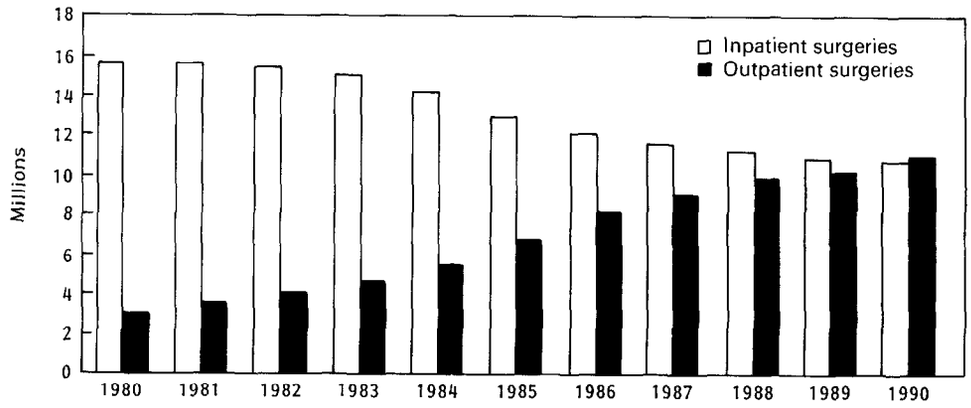

Figure 1. Hospital outpatient surgeries as per cent of total, by bed size, 1985 and 1990. Source: American Hospital Association Survey 1980–90.

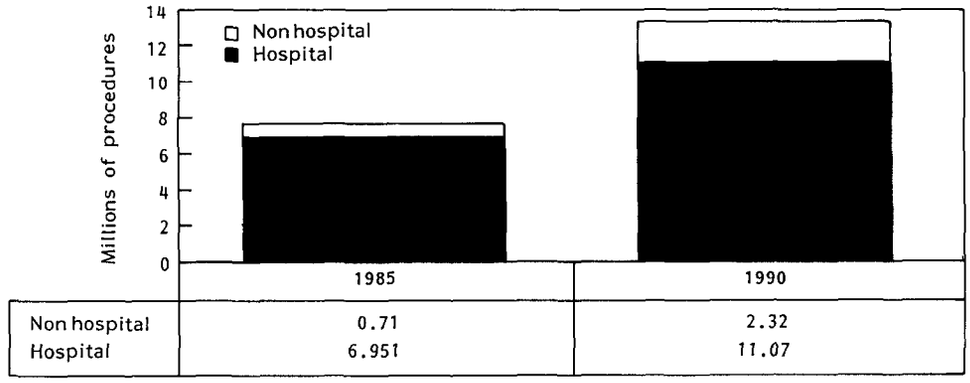

Figure 2. Comparison of surgeries performed by hospital vs nonhospital facilities. Source: American Hospital Association Survey 1980–90.

or allow the surgery to be performed in the outpatient setting. For example, gallbladder surgery and hysterectomies, surgeries that are among the 10 most frequently performed surgical procedures in the US are changing rapidly due to the use of laser and endoscopy. New techniques that are performed via endoscopy through small incisions or natural orifices are dramatically changing how surgery is performed, and particularly the length of recovery time needed after surgery. Some industry experts predict that 80% of abdominal surgery will be performed by endoscopy surgery by the year 2000[5]. With the development of newer shorter-acting anaesthetics and innovations in pain management, patients wake up quickly after surgery and have a smooth and swift recovery. It appears that the primary growth of ambulatory surgery in the future will be the conversion of inpatient procedures to outpatient as a result of new anaesthetic drugs and changes in technology.

Preoperative screening

The response by physicians to this exponential growth has been to take a proactive role in adequately screening and preparing surgical outpatients. As the complexity of procedures and patients increases, assessing patients prior to surgery has become integral to the quality of health care delivered in this setting. Preoperative screening can serve the following purposes: relieve patient anxiety; identify at risk patients; identify inappropriate patients, socioeconomic, administrative problems and initiate patient education. In addition, preoperative screening can improve operating room efficiency by reducing unnecessary cancellations and unanticipated hospital admissions. The interdisciplinary communication among anaesthesiologists, surgeons, primary care physicians and nurses is crucial in achieving these goals. Busy day-surgery units cannot rely on the surgeon alone to present them consistently with fully evaluated and prepared patients. This is especially true when a large number of surgeons with varying interests and attitudes have privileges to practice in many units. In order to expedite the evaluation process and ensure some degree of uniformity in the preoperative preparation, personnel other than surgeons in some facilities have found it useful to participate in the preoperative screening process. Therefore many modalities have been developed for preoperative screening: health questionnaires; telephone screening; facility visit before surgery, or combination of these.

A health questionnaire that systematically covers a review of systems, anaesthesia and surgical history, medication use, drug history, supplemented with a physi-

cal exam is an acceptable screening tool and should lead the clinician to select appropriate laboratory studies (Table 1). The accuracy of the questionnaire depends on the patient's comprehension and reliability and may not eliminate completely the need for a personal interview and physical examination. The disadvantage of this system is that if the questionnaire is completed in the physician's office, there must be a mechanism for timely review of the laboratory studies and medical information. These findings need to be communicated to the anaesthesiologist as well.

In the paediatric population, a telephone call conducted in advance of surgery has been reported to be an effective screening tool, reducing the rate of postponement or cancellation by approximately 50%. Patel and Hanallah[6] found that a comprehensive preoperative telephone interview including specific questions about prematurity, cardiac, pulmonary, renal, endocrine, and other anaesthesia-related risks is an effective method to identify anaesthetic risk factors that may require further preoperative evaluation. Calling parents during evening hours and encouraging them to call the centre during off-hours via an answer machine increased preop contact, thereby improving the prescreening process. Since the need for laboratory testing is minimal in the paediatric population, many institutions have adopted this approach and perform laboratory tests the morning of the procedure. Presurgical clinics/facility visits have achieved popularity because they coordinate a 'one-stop shopping' for the patient. Patients can undergo laboratory testing, consult with the anaesthesiologist, meet with nursing staff to initiate patient education, discuss pain management and reinforce preoperative and postoperative instructions in an unhurried manner. If the patient has not undergone a history and physical in the surgeons's office, depending on the facility, the patient may also undergo a physical examination at that visit. A facility or clinic visit can be combined with a health questionnaire which then allows the physician's time to be more directed to each patient. HealthQuiz, an alternative to the conventional health questionnaire, has been evaluated in this setting. HealthQuiz, designed by Roizen and colleagues at the University of Chicago, is a handheld laptop computerized questionnaire. The patient goes through a series of over 100 questions which can be answered with a simple "yes", "no", or "not sure" and takes approximately 10 minutes to complete. A summary of the patient's history is generated along with recommended laboratory tests based on the history. Lutner et al. have found the responses to be comparable to that of a personal interview and effective in reducing unnecessary laboratory tests, as well as maximizing the time spent with the examining physician or physician extender[7]. While a preoperative visit by an anaesthesiologist has traditionally been suggested to relieve patient anxiety in inpatients, the effectiveness of such a visit in reducing anxiety has been recently questioned[8–10]. Twersky et al. noted that ASA physical status 1 and 2 patients that were seen 1–7 days preoperatively had no further reduction in their anxiety scores compared to those patients that were seen for the first time on the day of surgery[8]. The role of the anaesthesiologist in prescreening ambulatory patients is undoubtedly important in assessing patient risk factors, anaesthesia plan, and need for further medical optimization. While the need for further consultation may be initiated by the surgeon, the anaesthesiologist often assumes the role of the primary care physician in evaluating patients and identifying particular medical issues that need to be addressed, prior to elective outpatient surgery. Each institution must decide for themselves what works best in their facility. Some form of preoperative screening prior to the day of surgery should be adopted in almost any active ambulatory surgery unit so that the necessary medical, administrative and financial information be obtained prior to the day of surgery, and appropriate steps for resolution of problems be taken. Because of variability among surgeons in medically evaluating patients, to ensure some degree of uniformity, the anaesthesiologist must participate in preoperative screening and evaluation.

Patient selection

Appropriate patient selection implies that, first, the patient agrees to the concept of short-stay admission and will be able to follow both preoperative and postoperative instructions, including specific information regarding nothing per os (NPO) status, medications, escort and postoperative care, or at least designate a responsible person for participating in the postoperative care. No longer is ambulatory surgery limited to ASA physical status 1 or 2 patients undergoing superficial or minor procedures. Table 2 lists the American Society of Anesthesiologists Classification (ASA Physical Status Classification) commonly used by anaesthesiologists to categorize patients based on medical status and risk. More recently, many adult patients with angina, hypertension, congestive heart failure, diabetes mellitus, asthma, chronic obstructive pulmonary disease, morbid obesity, as well as paediatric patients with sickle cell disease, former pre-term infants, respiratory infections, susceptible malignant hyperthemia may be scheduled for outpatient surgery. Many of these patients may be inappropriate for the outpatient setting. These problems can be uncovered during the presurgical testing and screening process. The patient should be in reasonably good health or at least in stable and optimized medical status. The appropriateness of ambulatory surgery for many of the problem patients we encounter during prescreening is determined by the projected postoperative needs and requirements of these patients during recovery from anaesthesia and surgery.

Occasionally, certain factors exist that prohibit cases from being performed on an ambulatory basis. Special individual consideration for reimbursable hospitalization is given under the following conditions: patients with coexisting medical conditions, that make prolonged postoperative observation by a nurse or skilled medical personnel a necessity; patients who lack proper home postoperative care; patients in whom there is a possibility

Table 1. Health questionnaire

PATIENT HISTORY

1. PLEASE FILL IN THE FOLLOWING FORM, ANSWERING THE QUESTIONS TO THE BEST OF YOUR ABILITY.
2. IF YOU HAVE ANY QUESTIONS, OR DO NOT UNDERSTAND SOME OF THE ITEMS, WE WILL CLARIFY THEM AT THE TIME OF YOUR INTERVIEW.
3. ANY REMARKS CAN BE WRITTEN IN THE SPACE PROVIDED AFTER THE ITEM LISTED.
4. *Anything marked "YES" should be further explained, including the dates involved, in the space provided under "Patient's Comments."*

GENERAL INFORMATION

NAME	AGE	HOME TELEPHONE NUMBER WORK
ADULT RESPONSIBLE FOR TAKING YOU HOME	**RELATIONSHIP**	**HOME TELEPHONE NUMBER WORK**
MEDICAL DOCTOR/INTERNIST		**TELEPHONE NUMBER**

TO BE CHECKED ON ADMISSION

HEIGHT	WEIGHT	TEMP.	PULSE	RESP.	B.P.	NPO	SINCE
							AM/PM

MEDICAL QUESTIONNAIRE

PLACE "X" IN PROPER COLUMN		YES	NO	DON'T KNOW
1 DO YOU HAVE ANY ALLERGIES?				
2 DO YOU TAKE THE FOLLOWING MEDICATIONS ROUTINELY AT HOME?	1 BLOOD PRESSURE PILLS			
	2 WATER PILLS			
	3 OTHER MEDICATIONS			
3 DO YOU TAKE ANY MEDICATIONS, INCLUDING NON-PRESCRIPTIONS OCCASIONALLY AT HOME?				
4 DO YOU HAVE TO TAKE ANTIBIOTICS TO PROTECT YOUR HEART BEFORE SURGERY?				
5 DO YOU SMOKE?				
6 DO YOU DRINK ALCOHOLIC BEVERAGES?				
7 DO YOU TAKE ANY STREET DRUGS?				
8 DO YOU HAVE ANY LOOSE, CHIPPED, CRACKED OR FALSE TEETH?				
9 DO YOU WEAR CONTACT LENSES?				
10 HAVE YOU EVER HAD ANY HEART PROBLEMS?	HIGH BLOOD PRESSURE			
	LOW BLOOD PRESSURE			
	RHEUMATIC FEVER			
	HEART ATTACK			
	HEART MURMUR			
	CHEST PAINS-CHEST TIGHTNESS			
	IRREGULAR HEARTBEAT			
	SHORTNESS OF BREATH			
	OTHER			
11 HAVE YOU EVER HAD ANY LUNG PROBLEMS?	ASTHMA			
	BRONCHITIS/PNEUMONIA			
	SHORTNESS OF BREATH			
	RECENT COUGH OR SPUTUM			
	TUBERCULOSIS			
	OTHER			
12 HAVE YOU EVER HAD ANY URINARY PROBLEMS?	URINARY INFECTIONS			
	KIDNEY STONES			
	OTHER			

PLACE "X" IN PROPER COLUMN		YES	NO	DON'T KNOW
13 HAVE YOU EVER HAD ANY DIGESTIVE TRACT PROBLEMS?	ULCERS			
	GASTRITIS			
	COLITIS			
	CHRONIC DIARRHEA			
	JAUNDICE/HEPATITIS			
	PANCREATITIS			
	HIATAL HERNIA			
	OTHER			
14 HAVE YOU EVER HAD ANY MUSCULO-SKELETAL PROBLEMS?	ARTHRITIS			
	BROKEN BONES			
	LIMITED JOINT MOTION			
	MUSCLE WEAKNESS			
	OTHER			
15 HAVE YOU EVER HAD ANY NEUROLOGICAL PROBLEMS?	CONVULSIONS/EPILEPSY			
	HEAD INJURY			
	FAINTING			
	HEADACHES			
	NUMBNESS/TINGLING IN EXTREMITIES			
	OTHER			
16 HAVE YOU EVER HAD ANY METABOLIC PROBLEMS?	DIABETES			
	THYROID DISEASE			
	OTHER			
17 HAVE YOU EVER HAD ANY HEMATOLOGICAL PROBLEMS?	ANEMIA			
	SICKLE CELL DISEASE/TRAIT			
	MONONUCLEOSIS			
	RECEIVED BLOOD TRANSFUSION			
	BLEEDING PROBLEM			
	OTHER			
18 HAVE YOU EVER BEEN TREATED FOR MENTAL PROBLEMS?	DEPRESSION			
	OTHER			
19 HAVE YOU EVER HAD/OR HAVE BEEN VACCINATED AGAINST THE FOLLOWING COMMUNICABLE DISEASES?	MEASLES			
	MUMPS			
	GERMAN MEASLES (RUBELLA)			
	CHICKEN POX			
20 IN THE LAST 4 WEEKS HAVE YOU HAD?	FEVER			
	CHILLS			
	COLDS			
	FLU			
21 HAVE YOU BEEN EXPOSED TO THE BODY SECRETIONS OF ANYONE LIKELY TO HAVE THE AIDS VIRUS?				
22 FOR PEDIATRIC PATIENTS ONLY	BORN PREMATURE			
	BREATH HOLDING SPELLS			
	HISTORY OF BRADYCARDIA			

NOTE: PATIENT HISTORY CONTINUED ON BACK

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OVER

Table 1. contd.

23. HAVE YOU EVER HAD AN ANESTHETIC?			YES	NO	DON'T KNOW
YEAR	OPERATION	TYPE OF ANESTHESIA: LOCAL	REGIONAL	GENERAL	*LOCAL-NUMBING SITE OF SURGERY REGIONAL-NERVE BLOCK GENERAL-WENT TO SLEEP*
24. HAVE YOU EVER HAD A PROBLEM WITH AN ANESTHETIC?					
25. HAS ANY BLOOD MEMBER OF YOUR FAMILY HAD PROBLEMS WITH AN ANESTHETIC?					
26. WHAT WAS THE DATE OF YOUR LAST MENSTRUAL PERIOD (FOR OB/GYN PATIENTS ONLY) ▶					

ITEM NUMBER	PATIENT'S COMMENTS		
		PATIENT'S SIGNATURE	DATE
		INTERPRETER'S SIGNATURE	DATE

ITEM NUMBER	PHYSICIAN'S COMMENTS		
		PHYSICIAN'S SIGNATURE	DATE

REVIEWED BY	DATE
RN	

Table 2. The American Society of Anesthesiologists' physical status classification

Classification	*Description*
Class 1	A healthy patient Example: Inguinal herniorrhaphy in otherwise healthy patient
Class 2	A patient with mild systemic disease Example: Diet-controlled diabetes; mild hypertension
Class 3	A patient with severe systemic disease that is not incapacitating Example: Coronary artery disease with angina; insulin-dependent diabetes; moderate to severe pulmonary insufficiency
Class 4	A patient with incapacitating disease that is a constant threat to life Example: marked cardiac insufficiency; advanced pulmonary, renal, or endocrine insufficiency
Class 5	A moribund patient not expected to survive for 24 hours with or without operation
Emergency (E)	The suffix E is used to denote the presumed poorer physical status of any patient in one of these categories who is operated on as an emergency (inappropriate for outpatient surgery)

that more surgery could follow the initial procedure; and technical difficulties, as documented by admission or operative notes. It is important to identify these special situations prior to surgery so that the necessary arrangements can be made. Common problems in patient selection will now be discussed including physical status, age, diabetes mellitus, child with upper respiratory tract infection (URI), malignant hyperthermia.

Physical status

The selection criteria have become increasingly liberal, in fact many patients in physical status 3 and rarely 4 are referred for ambulatory surgery, because of the nature of their procedure (e.g. carpal tunnel, extremity procedure, cataract extraction). The price paid for relaxing selection criteria may be an increased rate of unplanned hospital admissions, or in the case of freestanding surgery centres, increased transfers from a rate of 0.02–0.6% for ASA physical status 1 and 2 patients to a rate of 0.5–1.5% when some ASA physical status 3 are selected[11]. Even with the inclusion of sicker patients, the hospital admission rate should be below 2%. Natof, in a prospective study, found the incidence of perioperative complications in patients with preexisting disease (1.16%) comparable to patients with no preexisting disease (1.12%)[12]. He also reported that ASA physical status 3 and 4 may be considered candidates for ambulatory surgery if their systemic diseases are well controlled preoperatively. These circumstances require a dialogue among the treating primary care physician, specialist, surgeon and anaesthesiologist. In a retrospective review of over 87 000 cases performed in FASCs, an increased risk of perioperative complications occurred in patients who had preexisting cardiovascular diseases. The risk was reduced when symptoms were under good control for at least 3 months prior to the operation[13]. Physical status 3 and 4 are appropriate candidates for ambulatory surgery only when their health problems are well controlled, plans have been made for the postoperative monitoring and treatment of those problems and, of course, their home situation can accommodate their postoperative needs. When screening, the physician must evaluate how stable the patient's condition is. Would preoperative and/or postoperative hospitalization provide any benefit? What can be reasonably done to improve the patient's health status thereby decreasing the patient's risk of suffering a complication or decompensation? Some ambulatory units may not feel comfortable managing medically complicated cases and therefore, hospital units (integrated, separated) are more likely to accept these admissions because of the relative ease with which inpatient admission can be arranged.

Age

Age alone is not an exclusion criterion for ambulatory surgery. The important factors that play a role in determining the suitability for outpatient surgery are both the physiological age and functional state of the patient.

The very young

Although there are no definite studies that have determined the safe period to perform ambulatory surgery on full-term infants, many centres will perform ambulatory surgery requiring general anaesthesia after 2–4 weeks of birth; more conservative centres will wait 3–6 months. Healthy term infants fare well through the outpatient setting and allow the families to become actively involved in their perioperative care. The ability to resume normal feedings and basic needs can be best met at home with a nurturing family. Although there are some parents that feel reluctant to assume this responsibility, most families accept this willingly. The concern has primarily focused on anaesthetizing the premature and ex-premature infant for ambulatory surgery. These infants are at greater risk of developing life-threatening apnoea, hypothermia, irregular breathing, aspiration of liquids, and laryngeal spasm in the perioperative period. The appropriate age at which their respiratory and central nervous system has reached a mature state, reducing the likelihood of apnoeic spells, bradycardia and other cardiorespiratory difficulties varies in the literature from 44–60 weeks postconceptual age (postconceptual age is defined as the gestational age plus the postnatal age). Steward et al.[14] reported that preterm infants who require surgery during the first few months of life are more likely to develop respiratory complications during and following anaesthesia than are full-term infants. In a prospective study by Liu and colleagues[15], infants with a history of apnoea and a postconceptual

age below 46 weeks were observed to have prolonged apnoea after anaesthesia and surgery. Welborn reported that apnoea and/or periodic breathing did not occur in former premature infants whose conceptual age was more than 44 weeks, and who were without any major systemic disease at the time of surgery[16]. Kurth et al. observed an incidence of postanaesthesia prolonged apnoea in former preterm infants whose conceptual age was as old as 55 weeks and as late as 12 hours after anaesthesia[17]. The need for postoperative monitoring is also appropriate for a Sudden Infant Death Syndrome (SIDS) sibling less than 6 months old. The use of intravenous caffeine to stimulate the respiratory system in former preterm infants has been recently studied[18]. However, this intervention should still not change the need for postoperative monitoring. The age at which the premature infant attains physiologic maturity and no longer presents an increased risk must be considered individually, with attention given to growth and development, persistent problems during feeding, time to recover from upper respiratory infections, apnoeic history and presence or absence of metabolic, endocrine, neurologic or cardiac disorders. Infants with a history of respiratory distress syndrome, bronchopulmonary dysplasia, apnoea or aspiration with feeding should be symptom free before proceeding on an outpatient basis. Each institution must develop a middle ground between the conservative 60 weeks and the 44–46 weeks age range. Until more extensive meticulous prospective studies are carried out, it seems prudent to admit to the hospital all ex-premature infants less than 50 weeks postconceptual age so that they may be monitored for possible apnoea, bradycardia and oxygen desaturation. The responsibility of the medical team is to screen these high-risk patients before a decision can be made to proceed with ambulatory surgery.

The very old

With the increasing geriatric population and as more procedures continue to be shifted to the outpatient setting (e.g. herniorrhaphy, cataract extraction, transurethral resection of the bladder), it is not uncommon for patients in their 80s and 90s to be scheduled for ambulatory surgery. The advantages of managing geriatricians as outpatients are: minimizing their hospital exposure to nosocomial infections; iatrogenic errors and postoperative confusion. Chung et al.[19] reported that cognitive changes occurred in the elderly even after cataract extraction under retrobulbar block and intravenous sedation. The ability for the elderly to be restored to their own familiar environment, resume their daily activities and schedule (including taking chronic medications) with their support systems cannot be overemphasized. The disadvantage of the outpatient setting for elderly patients is that many times that support system (e.g. an elderly spouse) may not be capable of managing a postoperative patient. Ensuring that the patient is discharged to a responsible home setting will further minimize complications. Some elderly patients would benefit from admission after outpatient surgery if their medical conditions required further intervention postoperatively. Patients who received general anaesthesia may have prolonged recovery and confusion postoperatively, and may benefit from a longer postoperative period of observation[20]. Regardless of the anaesthetic technique chosen, the physician must be prepared to deal with problems related to coronary artery disease, hypertensive and chronic obstructive disease among other disorders. Studies have found only a weak correlation when the relationship between age and the rate of complications was evaluated[21–23].

The same recommendations that exist for selecting all outpatients certainly apply to neonates and geriatrics: if their systemic diseases are well controlled and further hospitalization would not be necessary for their postoperative care then they are suitable outpatient candidates. This underscores the necessity for prescreening patients via the various modalities previously mentioned.

Insulin-dependent diabetes mellitus

Because the spectrum of diabetes varies widely among patients, the concern about managing diabetics as outpatients centres around the fact that the disease is characterized by metabolic abnormalities that are not always predictable. Even the stress of minor surgery can tip the scale of glucose homeostasis out of control. Diabetic patients can benefit from outpatient management, because many are knowledgeable and proficient in their own insulin regimens and would prefer to take charge of their own treatment as soon as possible. Minimizing exposure to nosocomial infections in this population, as is the case with other potentially immunocompromised patients, is also an advantage of ambulatory surgery. Therefore, through the pre-screening process, some evaluation must be made of each patient's insulin requirements, diabetic control, prior hospitalizations due to diabetic ketoacidosis or symptomatic hypoglycaemia, along with any associated autonomic dysfunction, cardiac, renal or vascular disease[24]. An accepted method of managing diabetics is to schedule them early in the day, hold the a.m. dose of insulin and only after the patient has arrived in the ASC start an intravenous solution, test the serum glucose and administer an appropriate dose of insulin. The obvious concerns are maintaining glucose levels in a fasting patient and in whom postoperative nausea and vomiting may preclude significant oral intake. Should the patient be scheduled for later in the day, a light breakfast with partial insulin coverage is an accepted method of management. Once the patient has recovered, the patient should receive instructions prior to discharge regarding insulin coverage based on a recent serum glucose determination. Some patients will only need to take a partial dose of their longer acting insulin, while others would be adequately treated with short-acting coverage of insulin. Treatment should be individualized.

Child with URI

It has been estimated that the average pre-school child has approximately 5–10 colds a year. Therefore, scheduling a child for elective surgery during a safe period may be an impossible task. Accordingly, evaluating the child with signs and symptoms of an URI is important in reaching a decision whether it is safe to proceed with anaesthesia and surgery. The points to consider before making a decision in a child that presents with a URI, or runny nose, is that these symptoms may be completely benign, a noninfection condition — allergic or vasomotor (crying) rhinitis, in which elective surgery may be safely performed or that the presentation of a URI, runny nose, may be a prodrome, or actually be, an infectious process, in which it would be prudent to cancel elective surgery. What are the concerns about anaesthetizing a child with a URI? A number of studies reported in the literature that children with URIs had higher incidence of respiratory complications in the operating room, including laryngospasm, bronchospasm, stridor, breath-holding and transient postoperative hypoxaemia[25–27]. Most recently, Cohen et al.[28] reviewed a large prospectively collected paediatric database including 20 876 children without URIs and 1283 children with URIs for risk assessment of respiratory adverse events. They concluded that children with a URI were 2–7 times more likely to experience a respiratory-related event perioperatively. The risk was higher (11 times) in those who underwent general endotracheal anaesthesia. Because of these concerns, evaluating the child for any constitutional signs or symptoms as well as a change in activity and appetite can give the clinician a better gauge in deciding whether to proceed or not. Tait and Knight characterized a URI to include at least two of the following: sneezing; rhinorrhea; congestion; non-productive cough; low-grade fever $<101°F$; laryngitis, sore or scratchy throat[25]. Depending on the severity of these symptoms, it may be prudent to postpone elective outpatient surgery for at least one month. Of course, it may not always be feasible to postpone in those cases where the surgical procedure, such as myringotomy and pneumatic tube placement make actually be part of the therapy. Many anaesthesiologists have proceeded under these conditions for a low-risk procedure under general anaesthesia by mask, but recognize that they may be faced with a difficult airway. Intravenous access and possible premedication with anticholinergics may be useful under these circumstances.

Malignant hyperthermia

Fortunately, the incidence of malignant hyperthermia (MH) is rare occurring anywhere from 1 : 15 000 cases in children to 1 : 50 000 in adults. The pattern of responses of these patients under a variety of situations are now better understood. Malignant hyperthermia susceptibility (MHS) is not a contraindication to outpatient surgery. Postponement of elective surgery further sensitizes these patients to the belief that they are unable to obtain straightforward quality medical care. Patients with known MHS could be scheduled since dantrolene availability is recommended for all anaesthetizing areas in sufficient quantity to properly treat an adult patient. Just as all anaesthetizing areas have a cardiac defibrillator immediately available, dantrolene has a similar role in a patient who is healthy in every other respect who, when properly and promptly treated for an unexpected MH episode, should survive and recover uneventfully. Should MH occur, treatment should be reversal of metabolic crisis, stabilization and transfer to a hospital bed for further observation and treatment. MHS patients do well with nontriggering agents, even without the prophylactic use of dantrolene[29]. Patients undergoing MH muscle biopsies are done routinely as an outpatient procedure either under general or regional anaesthesia and are sent home 4–6 hours later, whether muscle biopsies are positive or negative. No major problems have been reported from centres that perform these procedures. In a large group of MHS who were anaesthetized with trigger-free anaesthetics, four out of 956 patients had modest febrile reactions in the PACU, three of which were treated with I.V. dantrolene; all recovered uneventfully[29]. Where should patients who are MHS be managed? Many feel that a hospital-based or separate unit would be better than a FASC should there be a need to admit and observe these patients. Since capnography is currently mandated as part of the monitoring for general anaesthesia, a rising end-tidal CO_2 would indicate a hypermetabolic state and strongly raise the suspicion of MH, even without the immediate confirmation of an arterial blood gas measurement, equipment which may not be available in all surgery centres.

The issue of masseter spasm or trismus, and resistance to opening the jaw continues to be a controversial area. At the present time nobody can decide which of these patients is susceptible to MH and are experiencing the beginning of a clinical MH episode and which are normal. Kaplan has summarized three different options[30]:

(1) stop the anaesthesia, treat for MH, monitor appropriately and later perform MH muscle biopsies if at all possible.
(2) continue with safe agents, monitor appropriately and perform muscle biopsy.
(3) continue triggering agents, monitor appropriately and perform muscle biopsy.

Appropriate monitoring includes end-tidal CO_2, temperature, oxygen saturation, pulse rate and blood pressure, muscle tone in other areas of the body, colour of the urine and electrolytes. Gronert et al. have suggested that anaesthesia may be continued with non-triggering agents if the only manifestation is trismus[30]. As the severity of resistance to opening the mouth increases, the likelihood of MH and therefore suspicion for MH should be increased. Most occurrences of trismus feature only trismus, and other factors being normal, patients could be discharged. It is hard to predict how long a postoperative observation is necessary. Flewellen has suggested an observation period of 4–6 hours, provided that no

Table 3. Recommended scheme for minimal preoperative testing

	Hgb	*WBC*	*Elect*	*Creat/BUN*	*Gluc*	*EKG*	*X-Ray*	*PT/PTT*	*Preg*	*Other*
Neonate	X									
Age <40	X									
Age 40–50	X					±				
Age >60	X					X	X			
Cardiovascular disease				X		X	X			
Pulmonary disease						X	X			
Malignancy	X	X								
Hepatic disease								X		SGOT/AlkPtase
Renal disease	X		X	X						
Bleeding disorder								X		Platelets, bleeding time
Diabetes			X	X	X	X				
Smoking >20 pack yr	X						X			
Possible pregnancy									X	
Diuretic use			X	X						
Anticoagulant use	X							X		

Sources: Modified from Roizen[34], Kaplan et al.[32] and Blery et al.[35]
Hgb, haemoglobin; WBC, white blood count; Elect, electrolytes; Creat/BUN, creatinine or blood urea nitrogen; Gluc, glucose; EKG, electrocardiogram; PT, prothrombin time; PTT, partial thromboplastin time; Preg, pregnancy test; SGOT, serum glutamic oxaloacetic transaminase; AlkPtase, alkaline phosphatase; X, obtain.

evidence of MH has arisen, and informs the responsible party of early signs of MH, the ability to communicate with a physician and be transported quickly back to a medical facility[31]. This particular scenario underscores the changing face of the ambulatory surgery population.

Laboratory testing

The history and physical examination are still the best means of preoperative screening and should lead the practitioner to order appropriate laboratory tests. Batteries of screening tests are not cost-effective, do not provide medicolegal protection and in fact may harm the patient[32,33]. Roizen et al. has extensively studied this area and has provided an elegant review of epidemiological studies in aiding the clinician to select appropriate laboratory tests[34]. Tests should be obtained only when their results will be part of the decision making. In fact, many centres have no mandated laboratory tests. Each centre must comply with their state regulations and medical staff to establish the necessary preoperative testing. Table 3 provides clinical recommendations for laboratory evaluation based on current knowledge of these tests[32,35]. The acceptable time frame for laboratory tests should be established by each facility. Acceptable time frame ranges from 14–30 days, unless the patient's underlying disease would dictate that testing be repeated closer to the scheduled procedure; chest radiographs and electrocardiograms taken within the past six months are acceptable if they were normal and the patient had no interval changes. The change in laboratory testing reflects the drive for appropriate patient preparation as well as cost containment in ambulatory surgery.

Conclusion

Where does the future lie for outpatient surgery? One of the most critical questions is where the outer line will be drawn from the limits of inpatient to outpatient shift. The number of procedures have climbed exponentially to over 50%. Will this climb continue or is it about to peak? Payors continue to put pressure on hospitals to do as much outpatient surgery as possible. Patients and their families have already adapted to the concept of short-stay and prefer not to be hospitalized if they can avoid it. The 1990s are not likely to see growth rates of 10% a year as in the early 1980s. In addition, as outpatient expenditures continue to rise, the focus of public and private utilization review and cost containment efforts inevitably will shift to the outpatient side. Technologies are likely to be more closely monitored and efficacies will need to be demonstrated. Payment reform, such as the proposed Ambulatory Patient Groups (APGs) will affect the outpatients just as Diagnostic Related Groups (DRGs) affected inpatient reimbursement. These changes may reduce the rate of growth in the most specialized procedures, but are unlikely to result in a reduction of outpatient revenues, or a reversal in the move from inpatient to outpatient surgeries. On the contrary, the number and proportion of surgeries performed in outpatient settings can be expected to increase in the future due to two major trends: the development of increasingly sophisticated technology will increase the type of surgeries that can be done on an outpatient basis and the increasing prevalence of managed care, with its incentives to serve patients in an outpatient setting where possible and appropriate, will continue to result in a shift from inpatient to outpatient surgery.

We are witnessing the changing face of ambulatory surgery underscored by the changing patient composition. It is the responsibility of the medical community to respond to these changes by upholding quality of patient management, and ensuring that patients are appropriately screened, selected and prepared for ambulatory surgery.

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Ambulatory Surgery 1993; **1**: 15–17

Review

Surgery of the hand — a genuine specialty for ambulatory surgery

E Brug, W Klein, J Overbeck

Trauma- and Handsurgery Department, University of Munster, Germany

The existing organization of funding and resource provision in Germany does not allow for implementation of outpatient surgery policies on a large or even very moderate scale. Nevertheless, for a wide range of procedures in hand surgery, this form of treatment offers the best option on a medical basis. Ambulatory surgery would also be the most economic option if reimbursement schemes were rationalized. The key issues for correct provision of ambulatory hand surgery care are the use of appropriately qualified personnel, correct choice of anaesthetic techniques, allocation of adequate resources and quality of care.

Key words: Hand surgery, outpatient surgery, ambulatory surgery

There has been considerable discussion about ambulatory surgery in Germany in recent years[1–3]. However, a suitable environment for growth of ambulatory surgery requires fundamental changes in hospital structure and funding, and these have yet to occur. Here, we discuss the suitability of hand surgery procedures in the ambulatory setting and outline the problems of instituting such changes in the prevailing health care environment in Germany.

Financing Ambulatory Surgery

German university hospitals do not normally participate in ambulatory surgery. They are allowed to perform surgical procedures on an outpatient basis only for training purposes. For this treatment, they receive about 80 Dm per patient per 3 months, irrespective of treatment and technique. This represents the remuneration that the university unit receives from the healthcare schemes, and the difference between this and the actual cost is paid by the State, which is responsible for the funding and training of medical university staff. So for economic reasons it is unprofitable to perform even minor ambulatory surgery in these institutions.

The non-university hospitals have other restrictions. Ambulatory surgery is carried out by surgeons in practice, who are not linked to a hospital and therefore have no allocation of hospital beds. In certain areas, where there is no such surgeon available, the hospital can obtain permission to take responsibility for the ambulatory procedures. It is quite natural that many surgeons in a hospital admit a patient for the shortest possible time, normally one day and night. The hospital management then charge the health care schemes single-day rates: about 250/500 Dm. This is very often insufficient to cover the cost even for a small operation in hand surgery. If it is not possible to hospitalize the patient for at least 1 day, the surgeon provides a bed for a few hours postoperatively without charge (quite similar to outpatient surgery). In cases like this, the owner of the hospital (city, church or State) must pay for most of the cost of surgery.

The consequence is this: in order to maintain and promote the present system with operations carried out by doctors in their own practice, the qualified hospital doctor is excluded from ambulatory surgery.

Surgery of the hand — is it minor surgery?

From the patient's point of view, whose demands concerning medical treatment have risen in proportion to the progress in medicine and the cost explosion in health care, the main concern is that he is treated by a surgeon whose qualification is comparable to that of a specialist surgeon in the hospital. Nevertheless, hand surgery is ideally suited to ambulatory surgery. There is a danger that the practice surgeon, who has never received formal training in hand surgery, performs many hand operations in the belief that ambulatory surgery is so-called 'minor surgery', which is performed easily without special education. More than 100 years ago, Hüter warned that

Accepted: January 1993
Correspondence and reprint requests to: Prof Dr E Brug, Department of Trauma- and Handsurgery, University of Münster, 4400 Münster, Germany

0966-6532/93/010015-3

there is no such thing as minor surgery, but only 'minor surgeons'.

The possibility for a patient to find a well-trained handsurgeon in a practice is very small, considering that less than 50 hand surgeons are practising ambulatory surgery in Germany at present.

Requirements for ambulatory hand surgery

Ambulatory hand surgery requires the same quality, experience and education as does hospital hand surgery. We believe that there should be at least a 2-year training period in a department of hand surgery before a surgeon is allowed to operate in this specialty. It is absolutely necessary for the surgeon to have access to a complete instrumentation set, including a microscope, or at least a magnifying glass, and a special operating table, as well as a pneumatic collar, with a manometer in order to apply a tourniquet and operate in exsanguination. According to one of the 'fathers of hand surgery', Stirling Bunnel, operating in the hand without a tourniquet is similar to repairing a watch in an inkpot[4].

Ambulatory anaesthesia

Two facts are chiefly responsible for the suitability of handsurgery to be performed on an outpatient basis: first, the hand is located in the periphery of the upper limb, and, second, it is possible to use regional anaesthesia. Every procedure can be carried out in plexus-block or Bier's-block. All hand surgeons should therefore have the ability to perform this type of anaesthesia in order to work without an anaesthesiologist. Normally, the education of the general surgeon does not include training in regional blockade.

In giving anaesthesia to a patient, a hand surgeon must be able to manage possible complications and to switch to general anaesthesia should regional anaesthesia fail. The surgeon therefore needs an anaesthesiologist to be available if he has no training in managing all cases of cardiopulmonary failure and other complications. 'Escaping' to local infiltration anaesthesia may be a comfortable option, but in handsurgery this is inappropriate and dangerous, because it may lead to small and uncertain exposures and renders operation in exsanguination impossible. In the case reports below we indicate why local infiltration anaesthesia should be avoided in handsurgery.

Case reports

Dupuytren's contracture (grade 1)
In this case there was no indication to operate in our opinion, but our aim here is to discuss the method used in this procedure. A small node was removed in very painful palmar infiltration anaesthesia, of course without a tourniquet. The consequence of the small exposure was a lesion to the palmar digital branches of the median nerve on both sides, with corresponding neurological deficit.

Carpal tunnel syndrome
Symptoms and neurological findings in a patient indicated an operation but not in infiltration anaesthesia. An additional fault was operation at the wrong location: from an approach 3 cm long proximal to the wrist fold, the median nerve was exposed proximal to the carpal tunnel where the origin of the compression was located. Outcome: the dysaesthesia remained, additional causalgia in the area of the scar and pain of a neuroma because of an injury to the pulmar branch.

Panaritium
With the words 'it's done in a moment' a cook's panaritium was incised *en passant* without any anaesthesia! Retraction of the finger due to pain not only led to a bigger incision over the whole finger-tip, which is now dystrophic and asensible, but resulted in a Sudeck's disease and shoulder-arm syndrome. Outcome: nearly completely ruined function of the arm.

These case reports are extremely negative examples, but if a management policy is advocated, the possible disadvantages and pitfalls have to be stated clearly. These are not the only cases we have seen in recent years. A long list of reoperations due to underestimation of the initial procedure could be added, as well as many cases with medico-legal implications.

Future goals for ambulatory surgery

A new policy in the field of ambulatory surgery must be introduced, but this cannot be achieved in the present German system, which allows untrained surgeons to perform 'little and easy operations'. A high medical standard must be attained, but this cannot be achieved without creating new costs.

For ambulatory surgery to operate correctly, it is essential that specialists are provided with the appropriate equipment and facilities. In addition, the skills of the specialist must be recognized: just because it is possible to perform a procedure on an outpatient basis, it does not necessarily mean that any surgeon is qualified to do so.

Outpatient hand surgery procedures

Provided that equipment and expertise are adequate, numerous operations can be included in an ambulatory operation service, including the following:

simple wounds (cuts, lacerations, crush injuries);
fresh injuries with foreign bodies;
injuries of the finger tips;
amputations following trauma, if repair is not possible or desired by the patient;
extensor tendon injuries;
small skin defects;
multiple small lacerations;
fresh closed fractures (excluding Bennet's fracture);
ligamentous injuries and joint dislocations.

The list of elective operations is even more extensive and includes the following indications:

nearly all benign tumours of the hand, such as ganglioma, fibroma, and xanthoma;
disorders of the tendons, such as trigger finger, or Quervain's disease;
tendonoses, such as tennis or golf elbow;
carpal tunnel syndrome;
button hole deformity;
Dupuytren's disease (second degree or limited to the fifth finger);
Swan neck deformity;
drop finger.

Many panaritia can be included, especially those located around the nail and the subcutaneous cases of middle and end phalanx. More proximately-located infections, and, above all, deep infections, must be observed and treated in the hospital.

All of these procedures must be carried out only with extensive knowledge of topographical and functional anatomy, with an intensive training in the specific operations of hand surgery and with appropriate equipment.

Summary

Hand surgery is most appropriate for ambulatory surgery for the following reasons:

1. There are relatively few diseases and disorders with general symptoms.
2. Anaesthesia is necessary only in the form of regional blocks of the upper extremity and general anaesthesia is seldom required.
3. Patients are able to leave the ambulatory unit shortly after surgery.
4. A wide range of procedures can be performed on this basis including injuries and post-traumatic disorders, many elective procedures and management of most hand and finger infections.
5. The number of hand units in Germany is still inadequate to meet the requirements of an industrialized nation, and the number of qualified hand surgeons with an ambulatory service is even smaller. Therefore ambulatory surgery of the hand must, at least in the short term, be covered by the hand units. For these departments, a system must be found that allows an economic service with maintenance of a high standard.

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Ambulatory Surgery 1993; **1**: 18–21

Review

The history of the Federated Ambulatory Surgery Association

W A Reed[1], B A Kershner[2]

[1]Surgicenter, Phoenix, Arizona; [2]Medical Management & Development Corporation, West Hartford, Connecticut, USA

The article is intended to provide the reader with a perspective of the creation and historical evolution of the Federated Ambulatory Surgery Association. This Association which began as the Society for the Advancement of Freestanding Ambulatory Surgical Centers, is the national clinical trade association for the non-hospital based ambulatory surgery industry. The article references the dynamics and circumstances surrounding the very first meeting and traces the progressive accomplishments of the organization from its inception in 1974 to its present level of activity in 1993.

FASA, the Federated Ambulatory Surgery Association located in Alexandria, Virginia, is the national trade association for the ambulatory surgical care industry. It currently represents almost 2000 facilities and individuals from 49 states, Puerto Rico, Canada and South Africa. Its membership is diverse and includes freestanding and/or hospital-affiliated for-profit ambulatory surgical centres, as well freestanding not-for-profit centres that are affiliated with, but organizationally separate from, hospitals. Its constituents are physicians, podiatrists, osteopaths, professional registered nurses, dentists, certified registered nurse anaesthetists, medical administrators, corporate health care officers, vendors and other health care professionals—all of whom are either involved with, committed to or, at the very least, have interest in the provision of high-quality and cost-effective ambulatory surgical care.

It is virtually impossible to separate the dynamics of the creation and growth of FASA from the creation and growth of the entire industry.

Accordingly, one cannot talk about the history and evolution of FASA without ascribing appropriate attention to the singular event which spawned this modality of health care.

The event being referenced occurred on February 12, 1970, and it was the opening of The Surgicenter in Phoenix, Arizona, the oldest surviving freestanding multispecialty outpatient surgical centre in the United States.

This facility started under the auspices of anaesthesiologists, Wallace A Reed, MD and John L Ford, MD and it was to focus attention on the applicability of performing ambulatory surgery under general anaesthesia not in a hospital setting and yet in a safe environment, thereby producing a revolution in health care.

An article appearing in an issue of *Arizona Medicine* talked about, "this new entity in the health care system". Concurrently, a panel discussion entitled, 'Ambulatory Surgical Care', sponsored by the American Academy of Anesthesiologists, considered the safety of the concept of ambulatory surgical care. It remained, however, for Drs Reed and Ford to show that high quality care and safety could be delivered and maintained outside both the physical and administrative framework of the hospital. The pioneers in this industry could not have been more aptly chosen. For it was their unswerving commitment to the preservation of the highest possible clinical standards which enabled their fledgling new facility to withstand all the pressures brought against it during its early days. Within 12 months of The Surgicenter opening its doors, over 400 visitors (not patients) toured the facility, all interested in learning more about it and anxious to replicate the experience.

It became clearly evident by this time that the idea of an independently operated surgical centre was attracting the attention of the health care system in a very powerful way and articles describing this new phenomenon appeared in *Medical World News*, *Medical Tribune*, *Medical Economics* and *Physician Management*. Indeed, in conjunction with these articles, two large national insurance companies promoted the new concept. Both talked about the promotion of high-quality, cost-effec-

Accepted: January 1993
Correspondence and reprint requests to: BA Kershner, Medical Management & Development Corporation, Corporate Center West, 433 South Main Street, Suite 219, West Hartford, CT 06110, USA

0966-6532/93/010018-04

tive ambulatory surgical care, and additionally expounded on the need for both qualitative and quantitative standards.

By early 1974 a second freestanding surgical centre appeared under the direction of Dr M Robert Knapp of Wichita, Kansas, and with both centres being innundated with requests for tours and information it became compellingly obvious to both Drs Reed and Knapp that there was a need for a forum for discussion and more to the point a need for the establishment of a national society to both act as a clearing house for information and to develop standards for ambulatory surgical facilities.

The enthusiastic group of organizers included Dr Boyden Crouch, anaesthesiologist at Surgicenter in Phoenix, Mr Bernard A Kershner, Medical Developer from Connecticut and former hospital administrator in New York, Dr Robert Likens, an anaesthesiologist from Louisville, Kentucky, Dr Neil Swissman, an anaesthesiologist from Las Vegas, Nevada and Mr Robert Williams, Administrative Director at the Surgicenter. The group was to be called the Society for the Advancement of Freestanding Ambulatory Surgical Care. The first meeting in November 1974 was entitled, 'The Impact of Ambulatory Surgical Care on the Health Care Delivery System.' In spite of the short lead time, a remarkably well-rounded programme was put together, (see Figure 1) covering political as well as medical aspects of the 'how-to's' of launching a freestanding outpatient surgical centre. 'Quality of Care' was covered by one of the pioneers of ambulatory anaesthesia, Dr John B Dillon. Donald S Orkand, President of the Orkand Corporation, a company that had just been awarded a contract authorized by the Department of Health, Education and Welfare (today's Health and Human Services Department) to determine whether freestanding facilities were a worthwhile addition to the health care system, described how the project would be conducted.

All of this activity, together with medically-oriented presentations and visits to the Surgicenter produced excitement and anticipation throughout the seminar.

In describing 'The Need for and the Objectives of the Organization,' Dr Knapp put 'highest quality of patient care' at the top of the list, saying with pride that this was to be "a patient-oriented organization!" As 'one of the most important' objectives, he listed the development of Standards of Care. "No less important an objective," Dr Knapp went on to say, is "to give continuing study to all possible efforts to minimize cost of such (ambulatory surgical) care without diminishing the quality of care."

By the end of the meeting, the new Society was up and running; the by-laws and constitution were approved, Dr Wallace A Reed was elected as the first President and the Charter Members left for their respective destinations with high enthusiasm for 'spreading the gospel' of this exciting new concept. Each year following the first, saw growth in the organization and meetings which were better attended with more extensive programmes.

From its inception in 1974 through early 1984, the Society operated out of the offices of the Surgicenter in Phoenix, Arizona. Mr Robert Williams, Administrative Director at Surgicenter, served in the capacity of Executive Director of FASA for the first 10 years of its life from 1974 to 1984. Although his time was limited his effort was not and he gave the fledgling group its first sense of organizational structure. In spite of limited support services, the organization grew and its growth was reflected in the parallel growth of the industry.

The Government Relations Committee was created early in 1980 with Mr Bernard A Kershner serving as its initial Chairman. With virtually no budget allocable to government relations activities, several individuals on the Board of Directors (Mr Kershner, Drs William Funderburk, Herbert Natof, M Robert Knapp, Wallace Reed and Harry Wong) frequently travelled, at their own expense, to Washington to attend meetings, offer testimony to both House and Senate Subcommittees on new or proposed legislation and to meet with representatives of government.

The efforts of the government relations committee (largely relating to seeking Medicare reimbursement) peaked in conjunction with the signing by the then President Jimmy Carter of the Omnibus Budget Reconciliation Act of 1980, which for the first time provided for Medicare reimbursement to freestanding ambulatory surgical centres.

By late 1983 it had become apparent to the then leadership of the Society that if the industry and its Society were to continue to grow and flourish, better organization, stronger financial capabilities, and more visibility on the national political scene were essential.

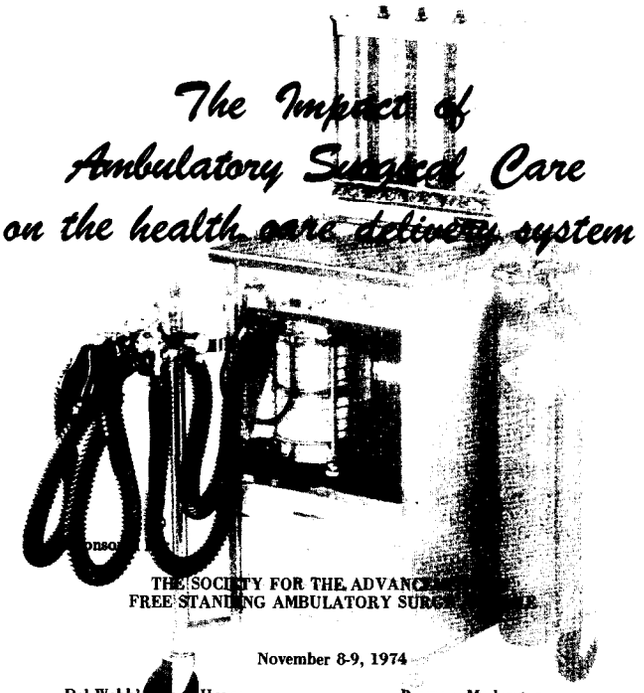
It also became obvious that the Society needed full-time staff and also needed to relocate to the Washington DC area. This direction was reinforced by several companies (Med-21, Alternacare, Surgical Care Affiliates, American Medical International, and Intermountain Health Care) some of which recently formed for the purpose of conducting business in this new and growing industry.

Mr Kershner presented an outline of a proposed new organization for the Society with full-time staff, offices in Washington DC, and a sufficient dues base to support the development of an agenda to address legislative, industry and political issues. New by-laws were prepared under the auspices of the Executive Committee and the name of the organization was changed to the Freestanding Ambulatory Surgical Association (FASA).

Corporate representation on the Board was accommodated in the new structure along with facility and individual representation. The membership also enthusiastically accepted the new by-laws at the 1984 Annual Meeting in San Diego and Mr Kershner, the newly elected and first non-physician President, was authorized to begin a search for full-time staff.

By 1986, the industry had outgrown the original boundaries as envisioned by the founding fathers and the designation 'Freestanding' did not seem as appropriate as it had 10 years earlier. After much deliberation; and in a move designed to preserve the FASA name, while embracing the changing dynamics of the now rapidly

A SEMINAR



The Impact of Ambulatory Surgical Care on the health care delivery system

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6:30 - 8:00	COCKTAILS Del Webb's TowneHouse
8:15 - 9:30	DINNER Guest Speaker – Daniel Cloud, M.D. AMA Trustee; Fellow of American Academy of Pediatric Surgeons Phoenix, Arizona "The Role of the Private Practitioner in Health Care Delivery"

SATURDAY, NOVEMBER 9

9:00 - 9:30	QUALITY CONTROL John B. Dillon, M.D.
9:30 - 10:00	IMPACT OF FREE STANDING SURGICAL CARE ON HEALTH CARE COSTS Joseph H. Clune Managing Consultant Metropolitan Life Insurance Company New York
10:00 - 10:15	COFFEE
10:15 - 10:30	THE POLITICAL HURDLES IN FACILITY DEVELOPMENT Neil Swissman, M.D. Diplomate of American Board of Anesthesiology Las Vegas, Nevada
10:30 - 10:45	FREE STANDING SURGICAL CARE AND THE ANESTHESIOLOGIST Robert W. Lykins, M.D. Diplomate of American Board of Anesthesiology Louisville, Kentucky
10:45 - 11:00	EVALUATING OUTPATIENT SURGICAL CARE Donald S. Orkand, President Orkand Corporation Silver Springs, Maryland

FRIDAY, NOVEMBER 8

8:00 - 9:00	REGISTRATION Del Webb's TowneHouse Late Registration Until Noon
9:00 - 9:15	WELCOME David Pent, M.D. President of the Maricopa County Medical Society; Fellow of the American College of OB-GYN Phoenix, Arizona
9:15 - 9:45	HISTORICAL REVIEW OF AMBULATORY SURGICAL CARE John B. Dillon, M.D. Former Chairman of Anesthesia Department at UCLA; Diplomate of American Board of Anesthesiology Koloa, Kauai, Hawaii
9:45 - 10:00	PROBLEMS WITH OUTPATIENTS UNDERGOING RECONSTRUCTIVE SURGERY Rex A. Peterson, M.D. Fellow of American College of Surgeons Catalina Surgical Suite Phoenix, Arizona
10:00 - 10:15	PROBLEMS IN THE OUTPATIENT GYNECOLOGICAL SURGICAL FACILITY William D. Lawrence, M.D. Fellow of American College of OB-GYN Phoenix Surgical Facility Phoenix, Arizona
10:15 - 10:30	COFFEE
10:30 - 10:45	PROBLEMS IN AN ALL-PURPOSE OUTPATIENT SURGICAL FACILITY Wallace A. Reed, M.D. Diplomate of American Board of Anesthesiology Surgicenter Phoenix, Arizona
10:45 - 11:00	PROBLEMS OF OFFICE RELATED FACILITY DEVELOPMENT Allan K. Clemenger, M.D. Fellow of American College of OB-GYN Arizona Medical Plaza Phoenix, Arizona
11:00 - 11:15	PLACE OF AMBULATORY SURGICAL CARE IN THE HEALTH CARE DELIVERY SYSTEM John W. Coyle Department of Research and Statistics Social Security Administration Washington, D.C.
11:00 - 11:15	FINANCIAL PROBLEMS IN FACILITY DEVELOPMENT M. Robert Knapp, M.D. Diplomate of American Board of Anesthesiology Minor Surgery Center of Wichita Wichita, Kansas
11:15 - 11:30	CONSTRUCTION STANDARDS IN FREE STANDING SURGICAL FACILITIES John L. Ford, M.D. Member of American Society of Anesthesiologists Surgicenter Phoenix, Arizona
11:30 - 12:00	PANEL DISCUSSION Dr. Dillon et al
12:00 - 1:30	LUNCHEON
1:30 - 2:00	REVIEW OF 23,000 CASES IN A FREE STANDING FACILITY Wallace A. Reed, M.D.
2:00 - 2:15	THE A.S.A. LOOKS AT AMBULATORY SURGICAL FACILITIES Donald E. Howland, M.D. Diplomate of American Board of Anesthesiology Surgicenter Phoenix, Arizona
2:15 - 2:30	COFFEE

THE SOCIETY FOR THE ADVANCEMENT OF FREE STANDING AMBULATORY SURGICAL CARE

2:30 - 3:00	NEED AND OBJECTIVES OF THE ORGANIZATION M. Robert Knapp, M.D.
3:00 - 3:30	CONCEPT AND DEVELOPMENT; CONSTITUTION AND BYLAWS Boyden L. Crouch, M.D. Member of American Society of Anesthesiologists Surgicenter Phoenix, Arizona
3:30 - 4:00	DISCUSSION

Figure 1. Programme from the inaugural meeting of the Association

evolving industry, the name was changed to 'Federated Ambulatory Surgery Association'.

Under the dynamic leadership of its executive director Ms Gail Durant, the new structure provided expanded services and activities. The Board of Directors was enlarged, non-physicians were encouraged to participate fully and indeed the new Board saw equal representation of clinical, corporate and individual facility interest. More committees were added to address and provide services in: group purchasing, public relations and media, liability insurance, and recovery care. Independent annual seminars were developed and are currently held for legislative matters and nursing practice issues. FASA now employs the services of a national marketing firm as well as an accounting and financial consulting firm to help meet its overall objective of not only enhancing public awareness and appreciation for the validity of the provision of freestanding ambulatory surgical care, but also the validation of the cost-saving benefits available through increased utilization.

FASA continues to evolve as is evidenced by the current mission statement endorsed by the Board of Directors in May 1992: "The Federated Ambulatory Surgery Association is an association which represents interests and concerns of the ambulatory surgery centre industry including extended recovery care before Congress and government agencies, business, industry, insurers and consumers; and develops, collects and disseminates information regarding ambulatory surgery issues to its members and other entities."

Even as FASA has grown and changed, it has remained true to its founding principles. It continues to speak for quality, cost effectiveness and appropriate clinical utilization in the ambulatory surgical centre setting. This commitment has served it well and will continue to endure for future generations.

Ambulatory Surgery: 1993; **1**: 22–24

Original papers

Ambulatory surgery: the need for indexes of substitution

J Colomer, A Alonso, A Serra, F Moreu

Hospital de Viladecans, Viladecans, Spain

The percentage figures for procedures which can be performed on an ambulatory basis vary in different studies from different institutions. This diversity seems to depend on individual clinicians' preferences for this type of surgery. Management policies for Day Surgery Units require follow-up and evaluation using accurate indexes of substitution. These make it easier to establish tangible objectives, give support to a system of incentives and enable comparisons to be made with other centres. The results of this study show how such an index can be used to monitor the shift in emphasis from inpatient to outpatient care for different surgical procedures and Day Surgery Units.

Key words: Ambulatory surgery, day-care surgery, management

In recent years, the demand for surgical treatment has increased considerably in Western countries. The increase in life-expectancy and in the quality of life, together with technological innovations in the fields of anaesthesia and surgery, are responsible for this increase. Budget limitations have given rise to the appearance of various alternatives to the conventional system of hospitalization: day hospital, home care, ambulatory surgery.

Ambulatory surgery has developed considerably in the last 15 years in the USA and Canada. More recently it has been introduced to Europe and is taking root progressively in different countries. This alternative system of treatment implies a considerable change in medical practice, which is not always accepted by the majority of professionals. The possibility of developing ambulatory surgery depends on several factors, but a modification in the attitude of surgeons is essential. The performance of a Day Surgery Unit (DSU) is closely related to a favourable attitude towards the practice of operations on an ambulatory basis.

The management of any DSU integrated in a medical care centre requires a mechanism for evaluating results and knowing the degree of acceptance of this type of surgery by the professionals involved.

The objective of this paper is to explore the possibilities of obtaining an index by which the operation of a DSU can be optimized.

Accepted: January 1993
Correspondence and reprint requests to: Dr J Colomer, Hospital de Viladecans, Avgda Gava s/n, 08840 Viladecans, Spain

0966-6532/93/010022-03

Materials

During the period October 1990 to November 1992, an account has been kept of the procedures carried out in the Hospital de Viladecans. More than 150 different ICD-9-CM (International Classification of Diseases (review) 9 Clinical Modification) procedure codes were gathered into 32 groups for easier analysis (Table 1). The number of operations performed involving hospitalization was 4874, and the number carried out in the DSU was 5595. This DSU (the Unitat de Cirurgía Sense Ingrés – UCSI) uses an area independent of the rest of the surgical block, and is comprised of two operating theatres, an immediate post-surgical reanimation room, a recovery room and the essential elements for administration, dressing rooms, waiting room, etc. . .[1].

In an operating theatre, 1812 operations of average complexity are carried out under various types of anaesthesia (general, locoregional, or local with sedation). This surgery is called Major Ambulatory Surgery (MAS)[2].

To establish the index, comparison is made between the numbers of ICD-9-CM category procedures performed on an ambulatory basis within a given period of time and the number of similar procedures carried out on the basis of conventional hospitalization. This is expressed as a ratio. In this way, the index reflects the degree to which emphasis has shifted from conventional to ambulatory treatment on a broad basis and also for a given procedure. Preselection of patients for ambulatory surgery enabled comparisons to be made between homo-

Table 1. Grouped procedures (the different ICD-9-CM codes for the procedures performed in the UCSI have been classified in homogeneous groups)

G 1A	Inguinal hernia repair
G 1B	Crural hernia repair
G 2	Excision of breast lump
G 3A	Anal fistula incision
G 3B	Anal sphincter incision
G 5	Cytoscopy
G 6	Circumcision
G 7	Excision of Dupuytren's contracture
G 8	Carpal tunnel decompression
G 9	Arthroscopy, diagnostic and operative
G 10	Excision of ganglion
G 12	Cataract extraction
G 13	Correction of squint
G 14	Myringotomy
G 15	Sub-mucous resection
G 16	Reduction of nasal fracture
G 17	Operation for bat ears
G 18	Dilatation and curettage
G 19	Laparoscopy with/without sterilization
G 21	Other procedures of cranial or peripheral nerves
G 22	Lacrimal duct procedures
G 23	Conjunctiva, other eye procedures
G 24	Other nasal and tongue procedures
G 25	Procedures on lymphatic structures
C 26	Ventral hernia repair
C 27	Vasectomy
G 28	Gynaecological procedures
G 29	Hallux valgus
G 30	Surgical material extraction
G 31	Other hand or foot procedures
G 32	Skin/subcutaneous procedures
G 33	Pilonidal cyst excision
G 34	Haemorrhoidectomy
G 35	Other procedures

Table 2. MAS substitution index. Net values exclude patients undergoing emergency procedures and those who do not fulfil selection criteria for ambulatory surgery

	Outpatient surgery	*Inpatient surgery*	*Substitution index* (%)
Net	1528	1672	47.8
Gross	1812	4874	27.1

genized groups. Procedures performed on an urgent basis have been excluded.

Results

The net MAS substitution index (Table 2) reflects the tendency to perform surgery on an ambulatory basis. This index for our hospital is 47%. However, a lower value must be expected if the cases for ambulatory surgery are not preselected (including emergency procedures or patients who do not fulfil selection criteria). The gross MAS substitution index is 27% for our hospital (Table 2).

The net MAS substitution index is an average value combining the different values for the different specialties (Table 3). In our hospital, the net subsitution index is maximal for urology 80.5%, and declines to 29.7% for ENT surgery. Between these values are the rest of the specialties: gynecology (71.6%), ophthalmology (53.7%) and general surgery (32.6%).

Table 3. Substitution index for specialties

Surgical specialties	*Outpatient*	*Inpatient*	*Substitution index* (%)
General surgery	240	497	32.6
Traumatology	223	242	48.0
Gynaecology	217	86	71.6
Ophthalmology	451	389	53.7
ENT	170	403	29.7
Urology	227	55	80.5
Total	1528	1672	47.8

Table 4. Substitution index for different surgical procedures

Procedures	*UCSI*	*Hospital*	*S.I.**
Cataract and lens	362	340	51.6
Laparoscopic sterilization	140	51	73.3
Removal of adenoids and tonsillectomy	139	245	36.2
Cytoscopy	138	7	95.2
Hernia (inguinal)	91	222	29.1
Pilonidal cystectomy	65	80	44.8
Carpal tunnel decompression	55	42	56.7
Ectropion and lacrimal duct	54	8	87.1
Circumcision <18 years old	51	47	52.1
Arthroscopy with/without procedure	50	8	86.2

*Substitution index (%).

The MAS substitution index can also be applied to individual procedures (Table 4). Cystoscopy (95.2%), eyelid surgery (87.1%), arthroscopy (86.2%) and laparoscopic sterilization (73.3%) are procedures with a substitution index greater than 70%.

Discussion

In October 1990, the Hospital of Viladecans inaugurated an autonomous Ambulatory Surgical Unit integrated in the main building (the Unitat de Cirurgía Sense Ingrés)[2]. The objective of this unit is to perform surgical procedures regardless of the type of anaesthesia (general, locoregional or local with sedation), where, after a period of time, the patient can be discharged on the day of operation.

Having this unit permits the development of a programme of major ambulatory surgery, i.e. the facility to perform a series of procedures which, until the opening of this unit required hospitalization. Since then the UCSI, as an alternative system to hospitalization, has allowed a 20% increase in surgical activity without the need to increase the number of inpatient beds.

Prior to opening the unit a working plan was developed

whereby patient selection was included in a protocol together with a listing of procedures.

The implementation of ambulatory surgery in different countries has not been easy. There are different reasons for this, the main ones being: lack of information on correct procedures; inadequate resources; lack of specialists; poor organization of units; inadequate financing systems[3], etc. . . . The relative importance of these vary according to the characteristics of the country and the type of health service.

Nevertheless, a resistance to change among clinicians is a common factor in different countries. The practice of ambulatory surgery means a substantial change in normal working practices predisposing to insecurity. The support of different scientific societies and official organizations, which is fundamental in this alternative health system, can bring about a change in attitude of the professionals and minimize the legal problems attributable to ambulatory surgery.

The practice of a given procedure on an ambulatory basis depends on several factors: the complexity of the procedure; the associated pathology; the patient characteristics, such as age, education, etc. . . . and social conditions. Nevertheless all this does not explain the great regional variability[4–6].

Various studies provide approximate percentage figures for procedures which can be performed on an ambulatory basis; the opinions of experts through consensus studies present figures which are generally very optimistic but in certain cases variable[7,8].

Nevertheless, it is useful to assess the activity of clinicians in each of the hospitals with a DSU. The substitution index allows the measurement of trends in ambulatory surgery in a day unit and enables comparison with other centres.

This index is influenced substantially by the predisposition and experience of clinicians, and this should not be forgotten in our attempts to achieve a positive attitude towards ambulatory surgery.

In our centre, which is under public ownership, and in which the doctor receives a salary for his work, it is important to look for systems of incentives. The substitution index permits the establishment of tangible objectives, which then enables a policy of management by objectives to be implemented. In this way, this index permits, within the service, the establishment of a measure of the degree of acceptance of this type of surgery among the different members of the team.

The growth of ambulatory surgery will necessitate the development of a great number of DSUs. Their evaluation by health administrations should be based, not only on their output, but upon a knowledge of their case-mix and obtaining optimization data. This information will then provide a measure of the value of the alternative system to hospitalization.

Possessing a tool of objective management in a health system is of prime importance. The substitution index permits a way of evaluating the activity of a unit by its progress as procedures change from inpatient to outpatient cases.

The optimization of ambulatory surgery will necessitate the taking of decisions with the aim of displacing a whole series of procedures which at present are peformed on hospitalized patients into an ambulatory setting. The degree of change that can be achieved will be determined by technical and quality issues. Outpatient care must never be inferior to inpatient care or there will be medical ethical problems.

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Ambulatory Surgery 1993; **1**: 25–30

Recovery characteristics of three anaesthetic techniques for outpatient orthopaedic surgery

G I Randel[1], S P Kothary[2], S K Pandit[2], M Brousseau[2], L Levy[2]

[1]Department of Anesthesiology, Northwestern University, Northwestern Memorial Hospital, Chicago; [2]Department of Anesthesiology, University of Michigan Medical Center, Ann Arbor, Michigan, USA

The goals of this study are to observe prospectively the perioperative recovery characteristics associated with general anaesthesia (GA), spinal anaesthesia (SAB), and epidural anaesthesia (EPID) in 200 patients scheduled for outpatient knee arthroscopy. Patients were observed from the time they entered the recovery room until they were discharged. Patients were contacted on postoperative days (POD) 1, 3, and 5. The EPID group had the quickest recovery times (125 ± 37 min, mean ± SD, ANOVA $P < 0.01$) compared with the GA group (165 ± 57 min) and SAB group (167 ± 51 min). Comparing the side effects of the three anaesthetic techniques, GA was associated with the highest incidence of nausea (27%) and vomiting (16%) on the day of surgery that persisted into the first postoperative day (nausea 41% and vomiting 22%). There was no difference in the incidence of headache overall; however, SAB was associated with a 13% incidence of postdural puncture (PDP) headache that became apparent on POD 3. All the PDP headaches resolved with conservative therapy by the first postoperative week, except for two patients who required an epidural blood patch. The EPID group followed by the SAB and GA groups, had the highest incidence of backaches on POD 1 (respectively, 63%, 41% and 17%). By POD 3, the incidence of backache was not statistically different between groups. No specific treatment for backache was required. The ideal anaesthetic has not been developed, but our data suggests that an epidural technique is advantageous for knee arthroscopy in terms of a quick recovery and minimal adverse effects.

Key words: Anaesthetic technique, general anaesthesia, regional anaesthesia, spinal epidural, outpatient anaesthesia recovery, postoperative complications, knee arthroscopy

The expansion of outpatient surgery over the past decade has challenged the anaesthesiologist to provide an anaesthetic with quick recovery and minimal adverse effects. Many outpatient surgical procedures are amenable to a variety of anaesthetic techniques. However, side effects are associated with all anaesthetic techniques, such as nausea or vomiting with general anaesthesia and headaches or the inability to void with spinal or epidural anaesthesia. These side effects can prolong the patient's stay in the recovery room or necessitate a return visit to the hospital. Also, the time courses for these common side effects during the perioperative period (when they appear, peak in severity, and resolve) differ for each anaesthetic technique. The pros and cons of each anaesthetic technique must be taken into consideration, as well as the patient's preference and the space and time constraints of the ambulatory surgical centre.

Clarke and Power, comparing postoperative morbidity of spinal anaesthesia with that of general anaesthesia, reported that patients receiving spinal anaesthesia had a high incidence of spinal headaches (39%) and backaches (36%); they recommended that spinal anaesthesia should not be used in patients under age 40[1]. Epidural anaesthesia has been compared with general anaesthesia for outpatient knee arthroscopy and is reported to offer shorter recovery times than general anaesthesia[2]. Finally, a retrospective case review by Orkin reported an increased incidence of severe backaches in patients receiving epidural anaesthesia with chloroprocaine[3]. To date, clinical investigations have not compared, for ambulatory surgery, the recovery characteristics of three common anaesthetic techniques (general

Accepted: January 1993
Correspondence and reprint requests to: Dr Randel, Northwestern University, Northwestern Memorial Hospital, Department of Anesthesiology, 303 E. Superior Street Rm. 360, Chicago, Illinois 60611-3008, USA
Presented in part at the Annual Meeting of the Society for Ambulatory Anesthesia, San Antonio, Texas, April 1989; and at the Annual Meeting of the American Society of Anesthesiologists, New Orleans, Louisiana, October 1989

0966 6532/93/010025 6

anaesthesia [GA], subarachnoid block [SAB], and epidural anaesthesia [EPID]) in a single study controlling for the type of operation. The goal of this study was to observe prospectively, in 200 ambulatory patients undergoing knee arthroscopy, the recovery characteristics commonly associated with GA, SAB, and EPID anaesthesia, including the incidence, time course, and severity of adverse effects.

Methods

This study was approved by our hospital Institutional Review Board. Each patient gave informed consent. Two hundred patients of physical status ASA 1 or 2 scheduled for an arthroscopic procedure of the knee on an ambulatory basis were studied in a non-randomized fashion over a seven-month period. Two surgeons performed all the operations. Three types of anaesthesia were offered (GA, SAB and EPID) to each patient by their anaesthesiologist; the anaesthetic administered was the patient's preference. Local anaesthesia was not offered since a tourniquet was used intraoperatively. Medications, such as fentanyl, midazolam, and droperidol, were administered perioperatively at the discretion of the anaesthesiologists.

General anaesthesia group

Anaesthesia was induced with thiamylal (4–5 mg kg^{-1}) followed by a short-acting and/or intermediate-acting muscle relaxant. After the trachea was intubated, and at the discretion of the anaesthesiologist, anaesthesia was maintained with a mixture of inhaled agents (nitrous oxide, isoflurane or enflurane) and fentanyl (1–2 μg kg^{-1} iv). Propofol was not used for induction or maintenance of anaesthesia. At the end of the procedure, neostigmine and glycopyrrolate were administered to reverse the muscle relaxant effects.

Spinal anaesthesia group and epidural anaesthesia group

Both regional blocks were performed preoperatively on patients in an induction room adjacent to the operating room to establish a sensory level of at least T_8. The number of attempts at placement of the needle was recorded for both the spinal and epidural groups. All SABs were performed with a Becton Dickinson 26-gauge, Quincke point needle. The spinal needle was placed at the L_{2-3}, L_{3-4}, or L_{4-5} interspace. The local anaesthetic employed was 5% lidocaine in 7.5% dextrose plain or with epinephrine, or 1% tetracaine in 10% dextrose.

In the EPID group an epidural catheter was placed in all patients with an 18-gauge Touhy-Schliff needle in the L_{2-3} or L_{3-4} interspace after localization with 1% lidocaine. Local anaesthetics employed were either 3% chloroprocaine or 2% lidocaine. Epinephrine (1 : 200 000 solution) and/or fentanyl (1–2 μg kg^{-1}) was added to the local anaesthetic at the discretion of the anaesthesiologist.

All recovery times were calculated from the time the patients entered the recovery room until the time they could tolerate oral fluids, ambulate, and void and were discharged home. Symptoms of nausea, vomiting, shivering, lightheadedness, hypotension, and pruritus that occurred on the day of surgery were noted, along with the need for analgesics or antiemetics in the postanaesthesia care unit (PACU) phase. Interviews on postoperative days (POD) 1, 3, and 5 included a standard set of questions regarding the presence and severity of symptoms, such as nausea, vomiting, backache, headache, muscle aches, and pruritus, as well as the need for analgesics. Upon further questioning, the headaches were categorized as 'postdural puncture' (PDP) when the description was consistent with the diagnostic features of PDP headache (onset, location, whether positional in nature, whether relieved in supine position, association with nausea and vomiting)[4]. Data were collected from the anaesthesia records, the PACU records, and from the postoperative interviews. Patients were excluded from entering the study if they would not be available for the postoperative interviews.

Data analysis

Analysis of variance (ANOVA) with the Scheffé test was utilized to assess differences in recovery times. Fisher's exact tests were used to determine if there were differences in incidences of symptoms on the day of surgery. Patients receiving intraoperative prophylactic antiemetics were excluded from statistical analysis regarding antiemetic treatment in the PACU. A difference was considered significant at a P level $\leqslant 0.05$. Bonferroni-corrected Fisher's exact tests (day of surgery) and χ^2 (postoperative days 1, 3, and 5) were used to compare the anaesthetics pairwise.

Results

Fourteen of the 200 patients were excluded from statistical analysis because two anaesthetic techniques were employed (GA after regional anaesthesia). Seven of these patients had received a spinal and seven had received an epidural anaesthetic. Thus, the data from 186 patients were analysed; 63 received GA, 61 received a SAB, and 62 received EPID anaesthesia. Although Surgeon B's surgical time was statistically longer than Surgeon A's (54.0 ± 64 vs 35.0 ± 13 min, mean ± SD, $P \leqslant 0.002$ respectively), all three anaesthetic techniques were equally distributed between them. The demographic data for each treatment group did not differ with respect to gender, weight or height, as shown in Table 1. The mean age of the GA group (27 ± 11 yr, mean ± SD) differed from that of the SAB group (35 ± 17 yr, $P = 0.003$).

Table 1. Demographic data for the groups of patients receiving general, spinal, and epidural anaesthesia

Technique	*Gender (m/f)*	*Age (yr)*	*Wt (kg)*	*Ht (cm)*
		(*mean ± SD*)		
GA	51/12	27 ± 11	79 ± 15	178 ± 9.2
SAB	48/13	35 ± 17*	79 ± 15	178 ± 8.6
EPID	41/21	30 ± 12	76 ± 15	175 ± 9.2

*$P = 0.003$ when compared to GA by ANOVA with Scheffé correction.

Table 2. Recovery time in minutes (mean ± SD, and sample size)

Technique	*Oral Intake* (n)	*Ambulation* (n)	*Voiding* (n)	*Discharge* (n)
GA	99 ± 45 (59)	133 ± 46 (59)	137 ± 48 (63)	165 ± 57 (63)
SAB	80 ± 34 (60)	135 ± 50 (60)	144 ± 55 (58)	167 ± 51 (61)
EPID	71 ± 34* (62)	99 ± 28† (61)	108 ± 36† (62)	125 ± 37† (62)

*Time to oral intake differed for EPID vs GA.
†Time to ambulate, void, and discharge differed for EPID vs SAB and GA. The above differences were significant at $P < 0.01$ by ANOVA with Scheffé correction.

Recovery times

The epidural group had significantly shorter recovery times than either the spinal or general group with respect to oral intake, urination, ambulation, and discharge, as shown in Table 2. The patients from the EPID group were discharged 40 minutes earlier than patients from the other groups. Two patients who received a SAB and one patient who had GA required catheterization to relieve urinary retention. Table 3 shows the major component of each anaesthetic technique employed and the discharge time for each technique. Within the SAB group, the type of local anaesthetic used was associated with significantly different discharge times.

Symptoms on the day of surgery

In the recovery room, the incidence of nausea and vomiting was highest in the GA group and least in the spinal group, as shown in Table 4. Twenty per cent of patients in the GA group who did not receive intraoperative prophylactic antiemetics required antiemetic therapy in the PACU. This was significantly higher than either the SAB group (0% required antiemetic therapy, $P = 0.0004$) or the EPID group (3% required antiemetic therapy, $P = 0.009$). No significant difference was present in the frequency of shivering, lightheadedness, hypotension, or pruritus among the three anaesthetic groups. In the EPID group only one patient (who received chloroprocaine with epinephrine) reported pruritus. No patients in any group reported a severe backache. Chi square analysis could not be applied for the analgesic requirements

Table 3. Discharge time for each anaesthetic agent

Technique (n)	*Agent* (n)	*Discharge times (min) mean ± SD*
GA (63)	isoflurane (39)	170 ± 62
	enflurane (23)	152 ± 44
	isoflurane/enflurane (1)	250
SAB (61)	lidocaine (44)	162 ± 49
	lidocaine/epinephrine (15)	170 ± 49
	tetracaine (2)	260 ± 49*
EPID (62)	chloroprocaine (14)	126 ± 46
	chloroprocaine/fentanyl (15)	124 ± 48
	chloroprocaine/epinephrine (13)	125 ± 23
	lidocaine (4)	130 ± 52
	lidocaine/fentanyl (14)	122 ± 22
	lidocaine/epinephrine (1)	120
	chloroprocaine/lidocaine (1)	165

*For the SAB group, tetracaine vs. lidocaine $P = 0.008$ and tetracaine vs. lidocaine/epinephrine $P = 0.03$.

Table 4. Prevalence of side effects (%) of the three anaesthetic techniques in the PACU and on postoperative days (POD) 1, 3, and 5

PACU	*Nausea*	*Vomiting*	*Headache*	*Backache*
GA	27[a]	16[b]		
SAB	0	0		
EPID	8	5		
POD 1				
GA	41	22[d]	19	17
SAB	10[c]	2	11	41[e]
EPID	32	11	18	63[f]
POD 3				
GA	8	2	16	19
SAB	10	3	19	31
EPID	6	0	11	29
POD 5[g]				
GA	5	2	8	10
SAB	10	3	16	20
EPID	3	0	12	9

[a]Nausea in PACU, $P = 0.0001$ for GA vs SAB and $P = 0.009$ for GA vs EPID.
[b]Vomiting in PACU, $P = 0.001$ for GA vs SAB.
[c]Nausea on POD 1, $P = 0.0001$ for SAB vs GA and $P = 0.002$ for SAB vs EPID.
[d]Vomiting on POD 1, $P = 0.0004$ for GA vs SAB.
[e,f]Backache on POD 1, $P = 0.003$ for GA vs SAB, $P = 0.0001$ for GA vs EPID and $P = 0.015$ for SAB vs EPID.
[g]One patient in the GA group and four patients in EPID group were lost to follow-up on POD 5.
All significances by χ^2 analysis with Bonferroni correction for multiple pairwise comparisons.

because of the various modes of administration (intravenous, oral, and epidural) of opioids and the different types of medications administered to patients (opioid and and nonsteroidal anti-inflammatory agents). There were no unanticipated admissions.

Symptoms on postoperative days 1, 3, and 5

Table 4 displays the overall prevalence of side effects on postoperative days 1, 3, and 5 for the three anaesthetic groups. No statistically significant differences were present in the frequency of muscle aches, pruritus, or analgesic requirements between the groups. On POD 1, the incidence of nausea, vomiting and headache was greatest in the GA group while backaches occurred more frequently in the two regional anaesthesia groups. Of the 41% of patients in the GA group with nausea on POD 1, 69% rated it as mild, 23% moderate and 8% severe. By POD 3 there were no statistically significant differences between groups.

Headache occurred with the same frequency on POD 1 in all the anesthetic groups. By POD 3, the frequency as well as the severity of the headaches was more pronounced in the spinal group; however, no significant differences existed. Although 12 (19%) patients in the SAB group reported a headache on POD 3, only eight of these patients (13%) had symptoms consistent with a PDP headache as previously described. Seven out of the eight PDP headaches occurred in patients 33 years of age or younger. The PDP headache was rated as severe in five patients, moderate in one patient and mild in two patients. Two patients required treatment with an epidural blood patch. No wet taps were reported by the anaesthesiologist in the EPID group and no PDP headaches occurred in this group.

Backaches were present in all the groups, with the EPID group having the highest incidence on POD 1 (63%) followed by the SAB group (41%) and GA group (17%). In terms of severity, patients in the EPID group with a backache on POD 1 rated it as mild, 42%; moderate, 52% and severe, 6% compared to mild, 60%; moderate, 32% and severe, 8% in the SAB group and mild, 73%; moderate, 27% and severe, 0% in the GA group (not statistically different).

Within the EPID group, data from patients receiving chloroprocaine, chloroprocaine with epinephrine and chloroprocaine/fentanyl were pooled into a chloroprocaine-based group and data from patients receiving lidocaine, lidocaine with epinephrine and lidocaine/fentanyl were pooled into a lidocaine-based group and the incidence and severity of backache compared. The mean (± SD) total volume of local anaesthetic given was 32.9 ± 9.8 ml for the chloroprocaine group and 31.9 ± 9.8 ml for the lidocaine group. Sixty-four per cent of patients in the chloroprocaine-based group reported a backache on POD 1 compared to 58% in the lidocaine-based group. Severity of backache was mild, 30%; moderate, 59% and severe, 11% in the chloroprocaine-based group versus mild, 64%; moderate, 27% and severe, 9% in the lidocaine-based group. None of these differences were statistically significant.

By POD 3, there was no difference in the incidence of backaches between the EPID, SAB or GA groups. No specific treatment for backache was required in any of the groups.

Discussion

Our current criteria for discharge home after an outpatient surgical procedure include the ability to tolerate oral fluids, ambulate, and void. The patients in the EPID group met these criteria significantly sooner than the GA and SAB group. We propose two reasons for this result. First, the EPID group received a less dense motor block than did the SAB group, and consequently could void and ambulate significantly sooner. Secondly, the EPID group had less nausea than the GA group which reduced the need for postoperative antiemetic treatment with its sedative side effects. This corroborates previous investigators' findings of longer discharge times in the recovery room in outpatients who suffer from postoperative nausea and vomiting[5]. Interestingly, the high incidence of nausea and vomiting in the GA group continued (and even increased slightly) into the first postoperative day; this persistence may be attributed, in part, to the use of narcotic analgesics in conjunction with inhalation agents. Although not included in this study, the routine administration of prophylactic antiemetics or use of newer intravenous agents (propofol) may decrease the incidence of nausea and vomiting[5-7].

At our institution, GA and EPID anaesthesia is employed more often than SAB in young ambulatory patients to avoid the possibility of PDP headaches. The incidence of PDP headache after subarachnoid block in our patient population remains unacceptably high at 13%, even with use of a 26-gauge Quincke point needle. This was lower than the 18% incidence reported by Clarke and Power, however, we concur with their recommendation that spinal anaesthesia should not be used in ambulatory patients under age 40[1]. Some authors report further decreases in the incidence of PDP headaches by utilizing a smaller gauge or different variety of spinal needle, such as the Sprotte or Whitacre[8-12]. For example, Dahl and coauthors, utilizing a 29-gauge needle for SAB in patients undergoing knee arthroscopy, found a 11% incidence of PDP headache[8].

Continuing postoperative follow-up was key in our ability to detect PDP headache. Our PDP headaches were not apparent until POD 3, perhaps because these orthopaedic patients are instructed to elevate their operative leg for the first day or two postoperatively and remain in a recumbent position. We believe therefore that follow-up on patients receiving a SAB for an arthroscopic procedure of the knee should be extended to at least POD 3 or 5. Often, these patients did not associate their headaches with the regional anaesthetic administered days before.

Previous studies have reported a 19–30% incidence of

backaches following spinal or general anaesthesia for different types of surgical procedures[13,14]. Differences in the incidence of backache could not be accounted for by patient position (supine, lithotomy, prone, lateral or sitting) during surgery or anaesthetic technique, however the incidence did increase with prolonged surgical duration. Dahl compared SAB with GA in patients undergoing arthroscopy of the knee and found an incidence of backaches of 26% in the SAB group versus 4% in the GA group; all of the backaches in his SAB group were rated as 'light' in severity[8]. Surgical position was not described. The incidence of backaches in our study was much higher, ranging from 17% in the GA group to 63% in the EPID group. The surgical position used at our institution may account for part of this result since the SAB and GA groups also showed a high incidence of backaches. In our study, only one surgical position was employed. The patient was positioned supine on the operating table with the nonoperative leg flexed at the knee with the hip in a neutral to slightly extended position; and the operative leg flexed at the hip while the knee was torqued at different angles during the procedure.

An increased incidence of severe back pain has been noted by several investigators in retrospective reviews when 3% chloroprocaine was used in the epidural space[3,15]. It has been suggested that this back pain is related to the administration of a volume greater than 25 ml. The average volume of local anaesthetic utilized in our study was 32.6 ± 9.6 ml. In contrast to Orkin's finding that all patients given over 50 ml of 3% chloroprocaine had back pain, one patient in our study received 56 ml of chloroprocaine with fentanyl but voiced no complaints of back pain. While this study was not designed (not randomized or double blind) to compare chloroprocaine with lidocaine administered in the epidural space, data from the EPID group was pooled into lidocaine-based and chloroprocaine-based anaesthetics. The incidence and severity of backache was not found to be different, which concurs with a previously published prospective, randomized, double-blind study[16]. The backaches present in our EPID group were not associated with any neurologic signs or deficits and did not require treatment.

This prospective study was not randomized. Randomization was precluded by an ethical belief that full informed consent, including discussion of all possible anaesthetic techniques needs to be given to patients prior to their procedure. Obviously this may introduce certain biases, however, the only demographic difference between our patient groups was in the older age of the SAB group. This probably reflects the general consensus regarding an increased incidence of PDP headache in a younger population. Also, this study did not encompass patients' prior history of headaches or backaches. Because the patient was allowed to choose their anaesthetic technique, patients with previous back problems may be underrepresented in the SAB and EPID groups. Finally, no attempt was made to limit the medications employed perioperatively. The intent of this study was to describe the outcome of three anaesthetic techniques and their short- and long-term recovery characteristics in the context of our daily anaesthetic practice.

Conclusion

The ideal anaesthetic has not been developed, but our data suggest that an epidural technique is advantageous for knee arthroscopy. Epidural anaesthesia provided the shortest recovery times with minimal adverse effects. The backaches present in the EPID group required no treatment and were not associated with neurologic sequelae. Although PDP headache can occur with epidural anaesthesia, the incidence is unlikely to be as high as we observed in the SAB group (13%). Nausea and vomiting in the EPID group was limited and did not affect discharge times.

Acknowledgements

Grateful acknowledgement is respectfully owed to Dr A Vanderspek, Associate Professor of Anesthesiology, Dr J Wahr, Instructor of Anesthesiology, for their helpful comments and Dr M Schork, Professor of Biostatistics, for his statistical guidance.

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Ambulatory Surgery 1993; **1**: 31–35

The reinforced laryngeal mask in dental day surgery

A P L Goodwin[1], T W Ogg[2], W T Lamb[2] and D M Adlam[2]

[1]Nuffield Department of Anaesthetics, John Radcliffe Hospital, Oxford; [2]Addenbrooke's Hospital, Cambridge, UK

Sixty adult patients undergoing removal of third molars under general anaesthetic in the Cambridge day surgery unit were randomly allocated to receive either a conventional anaesthetic employing nasotracheal intubation (NETT), pharyngeal gauze pack and inhalation agents or the reinforced laryngeal mask airway (RLMA) and total intravenous anaesthesia. Thirty patients were studied in each group. Immediate recovery times were significantly longer in the NETT group ($P = 0.01$). Surgical access was adequate in both groups. Postoperative muscle pains were significantly less in the reinforced laryngeal mask airway (RLMA) group ($P = 0.0001$). The RLMA provides a reliable method of airway management during removal of impacted third molars, with a reduction in postoperative morbidity when compared with conventional nasotracheal intubation involving the use of suxamethonium.

Key words: Reinforced laryngeal mask airway, day surgery, oral surgery

The aim of the present study was to investigate the use of the reinforced laryngeal mask airway (RLMA) in patients undergoing removal of impacted third molar teeth under general anaesthesia, with particular reference to intra- and postoperative morbidity.

The use of nasal endotracheal intubation is popular for intermediate and major oral surgery. At Ohio State University 5223 day patients underwent tracheal intubation with few serious complications. However there was a considerable morbidity, e.g. sore throat and suxamethonium afterpains[1]. Non-depolarizing muscle relaxants presently available may not be suitable for rapid day care procedures.

With the introduction of the Brain laryngeal mask airway[2,3] many day surgical procedures do not require endotracheal intubation. Recently a reinforced latex model of the laryngeal mask airway (Figure 1) has been manufactured. A pilot study indicated that the RLMA could be used during the extraction of wisdom teeth without significant problems. Muscle relaxants were not used for endotracheal intubation and no oropharyngeal gauze pack was inserted.

Accepted: January 1993
Correspondence and reprint requests to: Dr A P L Goodwin, Nuffield Department of Anaesthetics, John Radcliffe Hospital, Oxford, UK

0966-6532/93/010031-05

Method

The study had District Ethical Committee approval. Sixty adults (American Society of Anesthesiologists (ASA) classification I or II) undergoing the removal of third molar teeth under general anaesthesia in the day surgery unit were recruited into this prospective, randomized, parallel group study. All gave written informed consent. Their ages ranged from 16–50 years and their weights were within 15% of their ideal body weight. Exclusion criteria included a known history of chronic alcohol or drug abuse, pregnant or lactating females and any patient who had received a regular course of medication during the four weeks prior to surgery.

Patients were randomly allocated into two anaesthetic groups. Group A received a modified total intravenous technique with the reinforced laryngeal mask airway. Group B received a conventional inhalational anaesthetic involving nasotracheal intubation.

Prior to induction of anaesthesia critical flicker frequency (CFF) thresholds were measured using the Leeds flicker fusion tester. All anaesthetics were administered by the authors. Both groups received a standard anaesthetic induction with propofol 2.5 mg kg^{-1} (with 10 mg lignocaine in each 200 mg propofol) and alfentanil 4 μg kg^{-1}. Following induction, group A had an RLMA positioned and spontaneously breathed 33% oxygen in nitrous oxide via a parallel Lack system. Further boluses of alfentanil were given as deemed clinically necessary. An infusion of propofol at 10 mg kg^{-1} h^{-1} was delivered via an intravenous cannula using the Ohmeda 9000 infu-

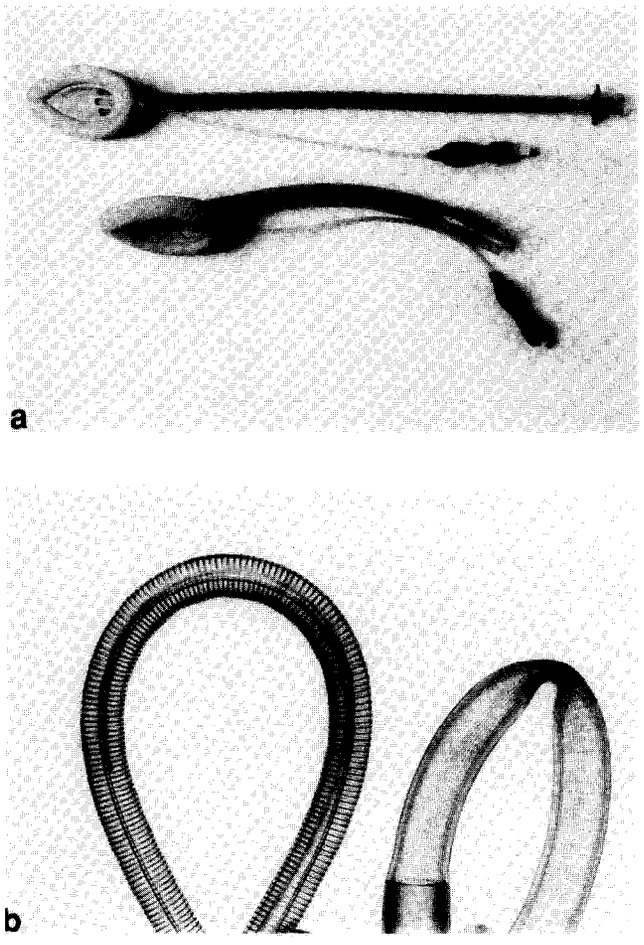

Figure 1. The conventional and reinforced (top in **a**; left in **b**) laryngeal mask airway.

Table 1. Mean (SD) age and weight of patients and number of teeth removed together with sex ratio for the RLMA and NETT groups

	RLMA	*NETT*
Age	23.95 (5.28)	24.9 (5.49)
Weight (kg)	63.35 (10.54)	63.51 (10.3)
Sex ratio male:female	6 : 24	6 : 24
Number of third molars removed	3.23 (0.971)	3.267 (0.98)

Table 2. Mean (SD) doses of propofol, alfentanil and suxamethonium, duration of anaesthesia and surgery and immediate recovery times for the RLMA and NETT groups

	RLMA	*NETT*
Propofol induction (mg)	175.33 (30.25)	174.33 (30.59)
Propofol maintenance (mg)	253.4 (92.27)	0
Total alfentanil (μg)	649.16 (164.8)	260.83 (70)
Suxamethonium (mg)	0	65.3 (16.91)
Duration of anaesthesia (min)	19.8 (5.66)	20.36 (7.35)
Duration of surgery (min)	15.9 (5.47)	16.33 (7.68)
Immediate recovery time (min)	6 (3.12)	8.16 (3.2)*

*$P = 0.0105$

sion pump (Ohmeda, UK). Further bolus doses of propofol were given to maintain a necessary level of anaesthesia. Following the standard induction, group B were given suxamethonium 1 mg kg^{-1} to facilitate nasotracheal intubation with an appropriate-sized red rubber uncuffed endotracheal tube. The oropharynx was packed with a moist, green gauze pack. Patients breathed 33% oxygen in nitrous oxide supplemented with enflurane 2–3%.

Airway difficulties encountered using both techniques were monitored. The pulse, indirect systolic and diastolic blood pressure, end-tidal carbon dioxide concentration, respiratory rate, oxygen saturation and inspired oxygen concentration were measured throughout the procedure. Following surgery, patients were transferred to a recovery room in the lateral recovery position. Patients breathed oxygen enriched air until they awoke. Awakening was defined as the time at which a Steward score (4) of 6 was first obtained. The immediate recovery time, i.e. the time from cessation of anaesthesia to awakening, was also recorded. Following removal, the RLMA was inspected for evidence of aspiration of stomach contents or leakage of blood from above.

Patients were invited to complete visual analogue scores (100 mm) for pain, nausea and headache at 30, 60, 90 and 120 minutes after a Steward score of 6 had been obtained. Critical flicker frequency thresholds were measured preoperatively and then at 60 and 120 minutes after immediate recovery. Analgesia was prescribed in the postoperative period as required.

On discharge patients were given a questionnaire to assess postoperative morbidity. This was completed after 48 hours and the questionnaire returned in the stamped addressed envelope provided. Data was analysed using *t*-test, multiple analysis of variance (MANOVA) and Wilcoxon signed rank test. Significance was considered to occur at $P < 0.05$.

Results

Sixty patients were studied (30 in each group). Table 1 shows the mean (SD) values for age, weight, sex ratio and number of molars removed. There were no differences in demographic data between the two groups. Table 2 outlines the mean (SD) doses of propofol, alfentanil and suxamethonium administered, duration of surgery and anaesthesia, and immediate recovery time. Immediate recovery time (time from cessation of anaesthesia to achieving a Steward score of 6) was significantly longer in the NETT group ($P = 0.0105$). There were no differences in cardiovascular parameters throughout the operative period. There were no differences in respiratory parameters throughout the operative period.

Problems with positioning the nasotracheal tube were

Table 3. Mean (SD) differences between pre- and post-operative critical flicker fusion thresholds (Hz) at 60 and 120 min post Steward score of 6

Flicker fusion frequency (Hz)	*RLMA*	*NETT*
Pre-op minus 60 mins	−0.436 (2.05)	−0.82 (2.03)
Pre-op minus 120 mins	−0.22 (2.93)	−0.48 (3.51)

Table 4. Median (range) visual analogue scores (mm) for pain, nausea and headache in the first two postoperative hours in the RLMA and NETT groups

*Time**	*RLMA*	*NETT*
Pain		
30 mins	41 (0–100)	48 (2–100)
60 mins	31 (0–80)	31 (2–93)
90 mins	24 (0–76)	25 (0–100)
120 mins	20.5 (0–77)	20 (0–81)
Nausea		
30 mins	0 (0–34)	0 (0–68)
60 mins	0 (0–28)	0 (0–57)
90 mins	0 (0–31)	0 (0–56)
120 mins	0 (0–28)	0 (0–47)
Headache		
30 mins	0 (0–87)	12 (0–78)
60 mins	1 (0–63)	9 (0–63)
90 mins	0 (0–48)	2 (0–72)
120 mins	0 (0–46)	1 (0–72)

*After Steward score of 6

encountered in seven patients. Problems included haemorrhage, difficulty in placing the nasotracheal tube in the trachea, as defined by more than one assistance with Magills forceps or a positional manoeuvre such as cricoid pressure or cervical flexion. In four patients the position of the RLMA was unstable needing repositioning. No patient showed any reduction in peripheral oxygen saturation during these difficulties. Surgical access was adequate in all patients in this study.

On inspection of the RLMA, following removal, there was no evidence of aspiration of stomach contents or leakage of blood from above. Postoperative laryngeal spasm was encountered in one patient in the nasotracheal group. No other postoperative airway problems occurred. Table 3 shows the mean (SD) differences between pre- and postoperative critical flicker fusion thresholds at 60 and 120 minutes post Steward score of 6. There were no significant differences within or between groups. Table 4 shows the median (range) visual analogue scores for pain, nausea and headache. There were no significant differences between the two groups.

Fifty-seven of the 60 patients returned the postoperative questionnaire (95%). Figure 2 shows the median (interquartile range) visual analogue scores for headache, sore throat, nausea, muscle pains, dizziness, drowsiness and oral pain in the first 48 postoperative hours. There were significantly less muscle pains in the RLMA group ($P = 0.0001$) in the first 48 postoperative hours. There were no other significant differences.

Postoperatively all patients considered that they had been given adequate information and instructions regarding their treatment in the day surgery unit. Two patients required the services of their general practitioner in the first 48 postoperative hours, both required further analgesia for oral pain. Three patients returned to hospital for treatment. Two in the RLMA group for pain and one in the NETT group for assessment of severe chest and shoulder pain, probably resulting from suxamethonium myalgia. The patient was reassured, given simple analgesics and advised to rest. Three patients were admitted postoperatively from the day surgery unit due to excessive bleeding. All three were in the nasotracheal tube group.

Discussion

Conventional anaesthetic practice for oral surgery involves nasotracheal intubation and the insertion of a pharyngeal gauze pack, thereby ensuring airway protection with a suitable operative field[5,6]. Muscle relaxants are usually required for intubation, but they have been omitted with varying success[7,8]. A higher postoperative morbidity for day-case dental surgery was reported in a group of patients paralysed with alcuronium and ventilated, when compared to a similar group receiving suxamethonium and breathing spontaneously[9]. Newer non-depolarizing muscle relaxants may reduce morbidity, but with short surgical procedures the need for adequate reversal and return of airway reflexes prior to extubation may reduce the number of cases performed on a day surgery dental list. It has been suggested that the duration of paralysis is a factor associated with postoperative morbidity[10]. Suxamethonium is commonly used for intubation of patients for short outpatient procedures[11], despite the fact that it induces muscle pains. Recently these have been reported to occur in between 41 and 63% of non-pretreated outpatients[12–14]. Pretreatment with non-depolarizing muscle relaxants decreases the incidence of post-suxamethonium myalgia, but does not abolish it[15,16]. Furthermore the incidence of postoperative myalgias may be unrelated to the use of suxamethonium[17], this study would support this. Postoperative myalgias occurred in the RLMA group.

The laryngeal mask airway provides a method of airway management without recourse to muscle relaxants. The laryngeal mask airway can protect the airway from contamination as demonstrated by the non-leaking of methylene blue placed in the pharynxes of 64 patients undergoing anaesthesia with the laryngeal mask[18]. Close fibreoptic inspection supported this finding and there is no doubt that the RLMA may be safely used for nasal operations[19]. Aspiration of blood is less likely than with dye since it is more viscous and tends to clot. Contamination of the lower airway did not pose a clinical problem in the present study. This has since been confirmed in this group of patients by fibreoptic examination of the tra-

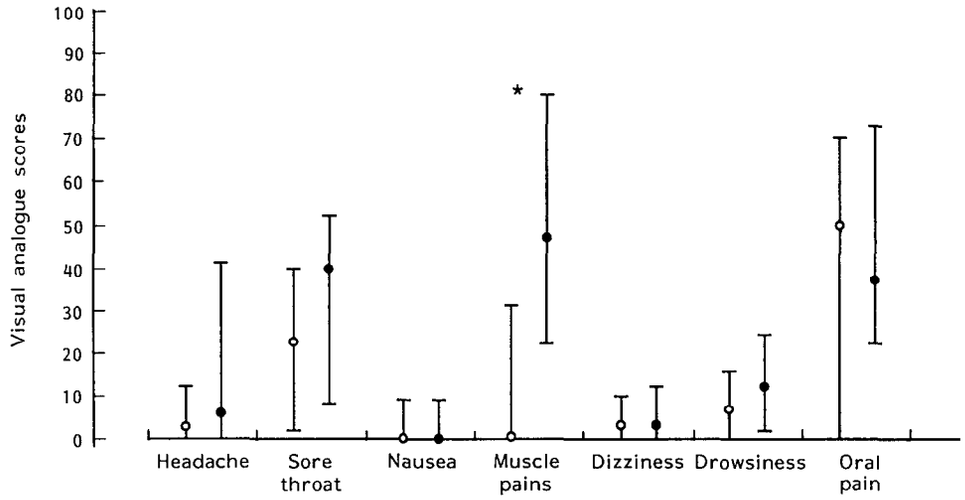

Figure 2. Median (interquartile range) visual analogue scores (mm) in the nasal endotracheal tube (NETT) and reinforced laryngeal mask airway (RLMA) groups for headache, sore throat, nausea, muscle pains, dizziness, drowsiness and oral pain in the first 48 post-operative hours. ● NETT = nasoendotracheal tube; ○ RLMA = reinforced laryngeal mask airway; $^*P = 0.0001$.

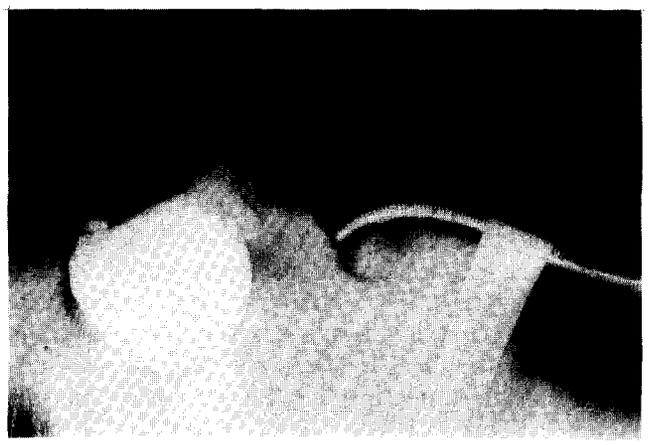

Figure 3. The reinforced laryngeal mask in place.

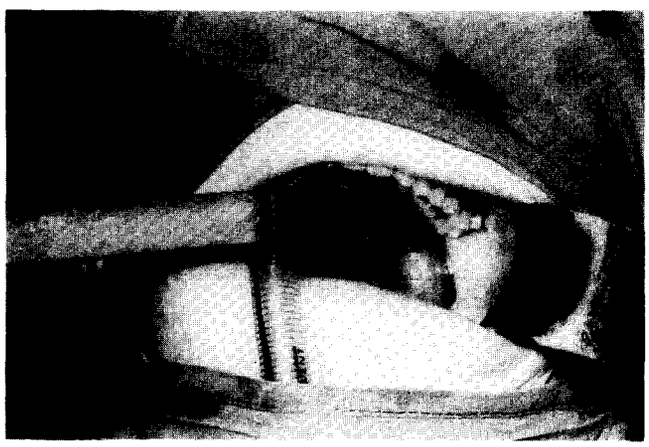

Figure 4. The surgical field.

chea prior to removal of the RLMA (P Davies, personal communication).

The laryngeal mask airway also provides an alternative to conventional nasal mask anaesthesia in paediatric dental outpatient anaesthesia, with superior oxygenation and no difficulty with surgical access, extraction or haemorrhage[20]. The prototype RLMA consists of a standard mask sealed to an armoured narrow bore tube of 10 mm internal diameter and 19 cm length. The tube, in this study, was secured to the lower mandible with tape (Figure 3) which allowed movement from side to side when dental retractors were used. No airway deterioration occurred with movement and the oral surgeons reported adequate surgical fields with the RLMA in situ (Figure 4). A degree of RLMA rotation occurred in four patients, a situation easily rectified by repositioning. These patients were female and a size 3 RLMA was used, but it has been suggested that the size 3 may be too small for females on occasion (Dr A J Brain, personal communication). Perhaps the use of a size 4 in these patients might have abolished any degree of rotation. Interestingly all four patients salivated excessively and this could have potentiated the problem. In the NETT group, difficulties were encountered with seven intubations. All were successfully intubated and only one patient in this group developed postoperative laryngeal spasm treated with oxygen, suction and head down tilt. No episodes of peripheral oxygen desaturation occurred in any of these patients.

Previous studies have shown that postoperative sore throats may be reduced if patients are not intubated[21]. This study has shown that the incidence of sore throat following the insertion of the RLMA was not significantly different when compared with nasal tracheal intubation. Suxamethonium has also been implicated with postoperative sore throats[22] but this was not confirmed by this study.

Finally we believe that the results from our study indicate that the use of the RLMA provides a suitable alternative for dental day-case anaesthesia. In associa-

tion with a total intravenous anaesthetic technique and no suxamethonium there was significantly less postoperative myalgia. It is conceded that postoperative dental pain remains a problem for day cases and further analgesic studies will be necessary to investigate this aspect. Perhaps the non-steroidal anti-inflammatory drugs may hold the answer.

Acknowledgements

The authors wish to acknowledge the expert care and assistance of Sister D E Sutherland and the day surgery unit staff at Addenbrooke's Hospital, Cambridge during this study and Intavent UK for providing the prototype reinforced laryngeal mask airways.

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Ambulatory Surgery 1993; **1**: 36–37

Short communication

Wound dressings for day surgery — a comparison of a conventional dressing (Mepore) with hydrocolloid (Granuflex®)

C J Cahill, J Page, P E M Jarrett

The Surgical Day Unit, Kingston Hospital, Kingston upon Thames, Surrey, UK

An extra thin hydrocolloid wound dressing (Granuflex®) was compared to a conventional dry dressing (Mepore) after intermediate and minor day surgical procedures. There was no difference between the two in dressing change frequency or outcome for hernia and varicose vein surgery. Minor surgery patients had significantly less dressing changes, and more patients in both classes were able to bath without disturbing the dressing when Granuflex was used. The hydrocolloid is significantly more expensive than the conventional dressing, but its other advantages may balance this in the day surgery context.

Key words: Bandages, occlusive dressings, ambulatory surgery.

Wound dressings on inpatients are managed by nursing staff with considerable expertise, much folklore, and often strongly held views on wound management. The day surgery patient leaves the unit with a dressing in situ, but the appropriateness of the dressing is often ill-considered, and instructions for redressing are frequently absent. General practitioners, district nurses and accident and emergency departments may assist, but all too often the patient returns after 7–10 days for suture removal with a soiled and unpleasant dressing scarcely adherent to the wound site.

Hydrocolloid dressings require less frequent changing than conventional dry dressings, and permit bathing or showering as they are completely occlusive. Their suitability for day surgery was evaluated in this study.

Patients and methods

Eighty-three patients undergoing hernia, varicose vein, and minor general surgical procedures (Table 1) were randomized to receive a conventional self-adhesive wound dressing (Mepore, Molnlycke) or a hydrocolloid dressing (Granuflex® extra thin, Convatec). A written information sheet was provided, and nursing staff recorded verbal consent to take part. Patients were provided with spare dressings of the same material, and asked to complete a diary card recording the timing and reasons for any dressing change. They returned to the day unit on the seventh postoperative day for evaluation of the wound, and suture removal if appropriate. Patients undergoing hernia and varicose vein surgery had subcuticular absorbable skin sutures (Dexon, Davis & Geck) which were not removed. The diary card also offered the opportunity to indicate whether the dressing used was 'very comfortable', 'acceptable' or 'uncomfortable'. Nurses enquired whether or not the patient had actually bathed, and whether or not a dressing change was necessary afterwards.

Table 1. Types of surgical procedure carried out on patients in study group

Procedure	*Mepore*	*Granuflex®*
Hernia	11	11
Varicose veins	12	11
Breast lump	5	2
Skin lesions	13	18

Results

There was no significant difference in the number of dressing changes between the two groups of patients undergoing intermediate surgery (Mepore mean 0.82, SD 1.01; Granuflex mean 0.41 SD 0.80), but the frequency of dressing changes was reduced in the minor surgery group. Patients with Mepore dressings had a mean 1.75 changes (SD 1.34) and Granuflex dressed patients 0.78 (SD 1.11). This was statistically significant ($U = 76$, $z = -2.45$, $P < 0.05$ Mann Whitney U test). One

Accepted: January 1993
Correspondence and reprint requests to: C J Cahill, The Surgical Day Unit, Kingston Hospital, Wolverton Avenue, Kingston upon Thames, Surrey KT2 7QB, UK

0966-6532/93/010036-02

Table 2. Comparative costs and sizes of Mepore vs Granuflex® dressings

Dressing	*Size 1*	*Size 2*	*Size 3*
Mepore	6 × 7 cm £0.22	9 × 10 cm £0.17	9 × 20 cm £0.32
Granuflex	7.5 × 7.5 cm £1.01	10 × 10 cm £1.25	5 × 20 cm £1.38

patient in each group had an operation on the hand, and these two were omitted in calculating the means, as the number of dressing changes ($n = 4$, $n = 6$) was considerably greater than for other sites.

No patient having intermediate surgery actually bathed in the first seven days in the Mepore group, compared to eight in the Granuflex group. Five of the Mepore minor surgery patients bathed, compared to 13 of the Granuflex group. Two out of five patients had to change a Mepore dressing after bathing due to discomfort or loss of adherence, compared to four of the 21 using Granuflex.

There was no difference in the incidence of bruised or indurated wounds between the groups (Mepore 8, Granuflex 10), but three patients had moist macerated and unsatisfactory wounds when a Granuflex dressing was removed on the seventh day for review.

Twenty-two of the 33 patients in the Granuflex group who indicated their opinion of the dressing considered it to be 'very comfortable', and four 'uncomfortable'. Thirteen patients considered Mepore 'very comfortable', thirteen 'acceptable' and one 'uncomfortable'.

Comparative costs of the sizes of dressing used are shown in Table 2.

Discussion

The principal functions of a wound dressing have been discussed by Leaper[1] and others[2]. The most important of these for a clean, primarily closed surgical wound are physical protection of the wound, absorbency to remove any exudate, prevention of secondary infection and maintenance of a suitable environment to promote healing. In addition, a dressing serves to shield the patient from any psychological anxiety about the appearance of the wound[3], and must be comfortable, inexpensive, and be removable without pain or damage to the healing scar.

Dressings after primary wound closure serve to absorb any exudate occurring in the first few hours, and to physically protect the wound from trauma. The relative merits of allowing the wound to dry with scab formation, against an occlusive dressing maintaining a moist environment to promote healing, are unproven. Either should prevent secondary infection, and this is confirmed by the absence of wound infection in this study.

A dry dressing that becomes adherent to the wound has the capacity to damage it during removal, and this problem may be increased if frequent dressing changes are required. The Mepore dressing was significantly less expensive than the comparable-sized Granuflex, but more frequent dressing changes, and assistance from general practitioners, community nurses and casualty departments with such dressing changes may completely negate this benefit.

Hydrocolloid dressings combine the merit of complete occlusion to prevent secondary damage or infection of the wound, with the capacity to remove exudate. Wound exudate and heat are retained, and both have the capacity to promote wound healing[4,5]. Low oxygen tension and a low PH may stimulate angiogenesis and accelerate epithelial growth[6].

Patients liked the Granuflex dressing and significantly more were able to bath normally without the need for a dressing change ($X = 7.98$, $P < 0.01$). The development of a macerated wound in our three patients could have been prevented by reducing the period of occlusive dressing, and 48–72 hours is probably adequate for most wounds.

Conclusion

Granuflex hydrocolloid compared favourably with Mepore adhesive surgical dressings in the day surgery context. The greater cost of Granuflex is balanced by decreased need for dressing changes, improved ability to bath normally, and patient satisfaction.

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Ambulatory Surgery 1993; **1**: 38–39

Short communication

Oximetry and capnometry monitoring during plastic surgery procedures with bilateral nasopharyngeal airways (BNPA)

D P Thompson, H Borden

Saint John's Hospital and Health Center, Santa Monica, CA; University of California, Los Angeles, CA, USA

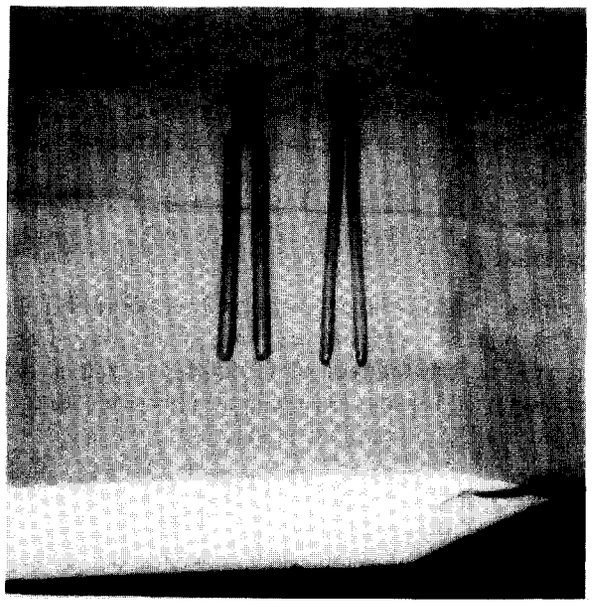

Figure 1. Bilateral nasopharyngeal airways.

The use of bilateral nasopharyngeal airways (BNPA) in anaesthesia was first reported in 1969 (Figure 1). This method is suitable for outpatient anaesthesia where mask would be impractical in facial areas and endotracheal intubation undesirable due to potential sequelae[1].

Patients for blepharoplasty, otoplasty, meloplasty, excision of tumours of the head, face and neck, and cataractectomy have been successfully anaesthetized with BNPA (Figure 2).

Ten patients were monitored with Datascope Accusat pulse oximeter and Ohmeda 5200 CO_2 analyser in the study. General anaesthesia with a semi-open breathing circuit was used with F_iO_2 90–100%, isoflurane 1–2% and midazolam 2 mg, and fentanyl 100 μg as preoperative medication. After topical anaesthesia with the BNPA in the hypopharynx[2], oxygen saturation was mea-

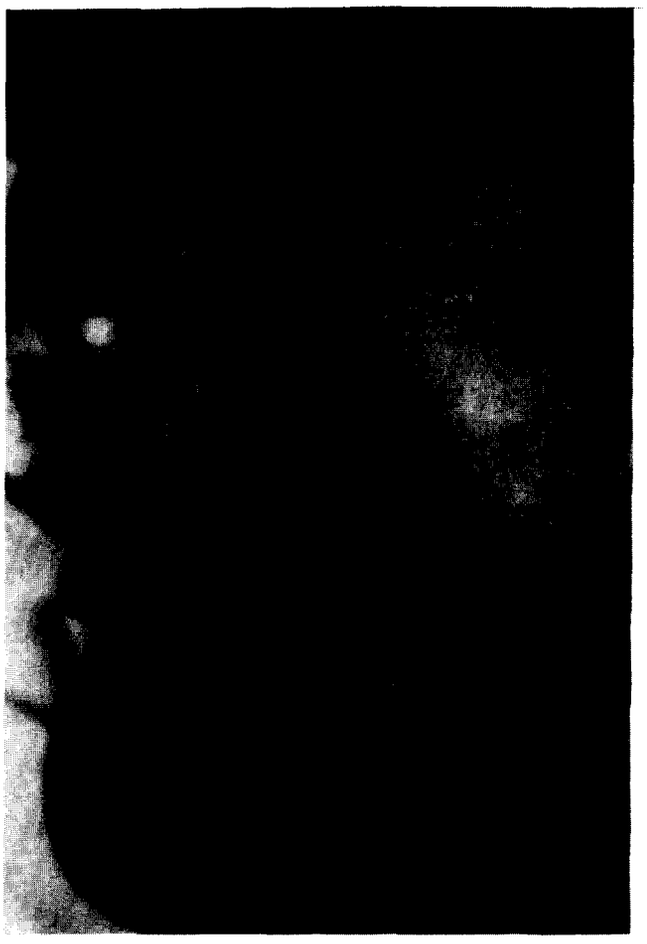

Figure 2. Facial tumour.

Accepted: January 1993
Correspondence and reprint requests to: Dr D P Thompson, 2001 Santa Monica Blvd, Suite 1180 W, Santa Monica, CA 90404, USA

0966-6532/93/010038-02

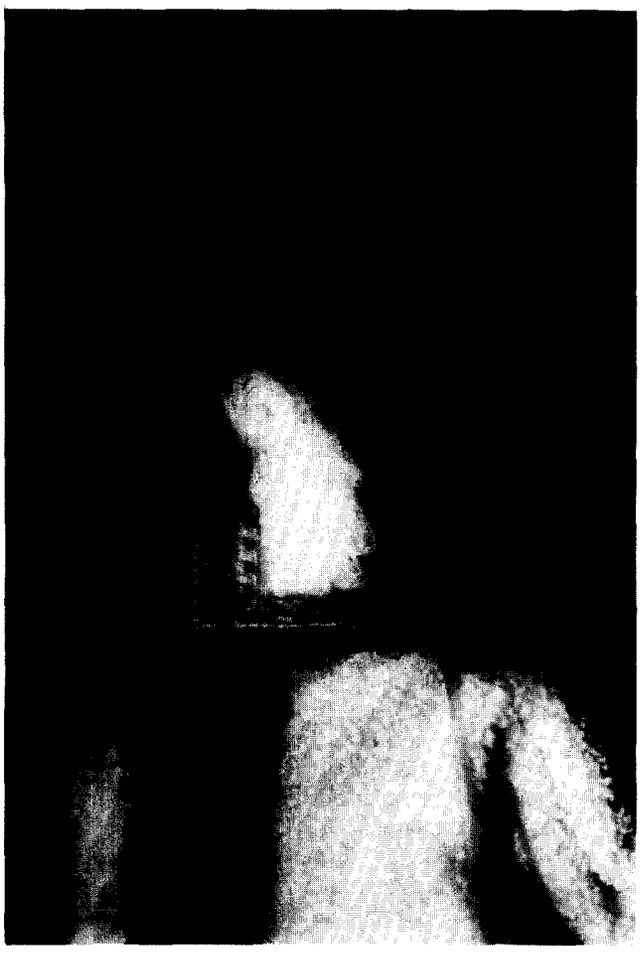

Figure 3. CO_2 adaptor in place; gauze covering mouth.

sured at the fingertip and end tidal CO_2 ($ETCO_2$) at the BNPA adapter. O_2 saturation ranged between 98 and 100% with $ETCO_2$ 38 ± 4 mg.

Assessing adequacy of ventilation with BNPA in a semi-open breathing system has been difficult. While pulse oximetry affords information on the adequacy of oxygenation, no means of measuring hypercarbia or hypocarbia, prompt airway obstruction or accidental oesophageal intubation have previously been available prior to capnographic monitoring. Functioning as a 'pop-off' valve, the oropharynx is diluted with the atmospheric air unless the mouth is sealed (Figure 3). Surgery

Figure 4. BNPA in place.

of the eyes, face, head, and neck offer a method not requiring endotracheal intubation which can cause orotracheal complications such as tracheitis, cough, and spasm. Outpatient procedures utilizing BNPA in adults and children can be safely performed with modern monitoring techniques including oximetry and capnometry.

Patients undergoing ocular procedures including strabismus correction, vitrectomy, cataractectomy[3] and plastic surgeries of the face including meloplasty, blepharoplasty, otoplasty, excision of minor tumours of the face, head and neck can be safely monitored under general anaesthesia (Figure 4).

The method is simple, atraumatic, muscle relaxants are not required, instrumentation with laryngoscope is not needed, and the procedure does not provoke coughing. There is no post-intubation pharyngitis and no tendency toward increased intraocular pressure.

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Congress report

New Orleans: American College of Surgeons, 1992 Clinical Congress: Panel on Ambulatory Surgery

The title of the panel was 'Ambulatory Surgery for the 90s and Beyond' and the members of the panel were: Dr Michael Ribaudo, a plastic surgeon from St Louis, Missouri; Dr Ronald Landry, ophthalmologic surgeon, New Orleans, Louisiana; Dr Gustavo A Colòn, plastic surgeon, New Orleans; and Dr William Matthews, anaesthesiologist, Newport Beach, California.

The multidisciplinary panel was primarily aimed at discussing the different aspects of ambulatory surgery as they exist today. The emergence and the historical concepts and evolution of outpatient surgery from the 1960s to the present were outlined. Dr Ribaudo, who is President and founder of Metropolitan Plastic Surgery Ltd. and owner of a multispecialty ambulatory surgical facility in St Louis, Missouri, discussed at length his experience in dealing with the multispecialty, large outpatient surgical facility which is primarily physician-owned and operated.

Dr Ribaudo emphasized the rapid growth that has taken place in this field; for example, the first freestanding unit appeared in 1970 and there are now more than 1700 in the United States. It is now possible to perform more than 2500 different surgical procedures on an outpatient basis, and 15 000 procedures per year are carried out in his unit. It is predicted that some 70% of procedures in the US will be performed on this basis by 1995. He feels very strongly that the evolution of his facility has occurred over the years and it is a very well-oiled machine that offers the patient a great deal of flexibility as well as safety, within an environment which is just short of having in-hospital care, because a 23 hour overnight recovery facility is also offered. The modern facilities that Dr Ribaudo uses in St Louis certainly demonstrate what is state-of-the-art for outpatient ambulatory multispecialty facilities in the 1990s. In the US, the ownership of such facilities is largely independent (67%), with 21% belonging to corporations and only 11% under hospital ownership.

Dr Landry, Medical Director of Eye Care Associates in Metairie, Louisiana, spoke about construction and design and a successfully run unispecialty facility for multiple ophthalmic surgeons. He stressed, in an era where decreased cost reimbursement for specific Medicare patients, particularly those that are undergoing ocular surgery and the decreasing reimbursement to hospitals for cataract surgery, etc., that the need for an ophthalmic surgeon to create his own surgical facility was almost a competitive necessity. Dr Landry described the creation of his facility from design to completion to function, as well as the day to day care and operating of an outpatient ophthalmologic surgical facility that cares primarily for the elderly eye patient, stressing that this system of management offers closer monitoring than is possible in a general hospital.

Dr William Matthews discussed the necessity for appropriate critical care management, anaesthesia, and emergency care within an ambulatory surgical facility. He stated that all outpatient facilities are separate from the umbilical safety of a hospital setting and that every emergency criteria that one must adhere to in a hospital must be adhered to in an outpatient surgical facility. He feels very strongly that the era has passed where an outpatient surgical facility would not have the appropriate safety, anaesthesia and surgical standards to stand alone as a safe, well-qualified, accredited and standardized facility.

Dr Gustavo Colòn, President of the American Association for the Accreditation of Ambulatory Plastic Surgical Facilities, discussed accreditation organizations, (including AAAHC and JCHO). The AAAAPSF is the accrediting organization that accredits office surgical facilities for plastic surgeons. This organization has been in operation since 1979 and up to the present time has accredited well over 400 facilities.

The conclusion of the panel, with a great deal of input from the audience, was that ambulatory surgery is something that is here to stay and will increasingly affect general surgeons as more endoscopic surgical procedures are performed. These surgical procedures will certainly be brought out of the hospital arena into the outpatient surgical setting. It was felt by the audience present at the American College of Surgeons Panel that the members of the panel gave them insight into what ambulatory surgery is and what they need to look to if they plan to create an ambulatory surgical facility separate from a hospital setting from standards to the critical criteria for patient safety.

Gustavo Colòn
Plastic Surgery Associates,
Metairie, LA 70006
USA

0966–6532/93/010040–01

Ambulatory Surgery 1993; **1**: 41–42

Congress report

New Orleans: American Society of Anesthesiologists (ASA) Annual Meeting, 17–21 October, 1992

At the American Society of Anesthesiologists (ASA) Annual Meeting on 17–21 October, 1992, several ambulatory anaesthesia scientific papers were presented in oral, poster or poster-discussion sessions. This review presents only some of the many outstanding papers.

Thomas A Joas, San Diego, California moderated the poster-discussion session, and the discussants Jeffrey L Apfelbaum, Northbrook, Illinois and Paul F White, Dallas, Texas, skilfully kept the audience interested. Steven Manley, Illinois Masonic Medical Center and the University of Illinois College of Medicine, Chicago, Illinois, discussed the question, 'Is Routine Preoperative Pregnancy Testing Necessary?'

Dr Manley and colleagues did pregnancy testing on women of childbearing age who were scheduled for outpatient surgery at the medical centre. They found that of the 2056 women tested, seven were pregnant, yielding an incidence of 0.34%. None of the seven patients was aware of their pregnancy status, and these surgeries were subsequently postponed. The authors suggest that routine preoperative pregnancy testing should be performed prior to elective same day surgery.

Comments: There was a feeling among the discussants that if the patient states there is no chance that she could possibly be pregnant, a pregnancy test would not be necessary and would only add to the costs of the ambulatory surgery. On the other hand, if the patient indicates there might be a chance of pregnancy, the test is indicated. Of course, the local policy of the facility should be followed.

Peter J Alderson, and Jerrold Lerman, of the Hospital for Sick Children, Toronto, Ontario, Canada, presented a poster on 'Comparison of Ketamine and Midazolam as Oral Premedicants for Ambulatory Anesthesia in Children.' They compared ketamine 5.0 mg kg (0.1 ml kg^{-1}) and midazolam 0.5 mg kg^{-1} (0.1 ml kg^{-1}) in 46 children under 6 years of age undergoing dental surgery.

Both premedicants effectively produced sedation within 20 min, but discharge home was delayed by the ketamine premedication (110 ± 28 min) when compared to midazolam (90 ± 22 min). The results suggest that midazolam may be preferable to ketamine in a busy ambulatory surgery unit.

Comments: In adults, anaesthetic dosages of ketamine have been shown to be associated with slower recovery compared to recovery after thiopental. This study confirms slow recovery after ketamine premedication in children as well.

In their poster presentation on 'Isoflurane Versus Propofol for Maintenance of Anesthesia for Ambulatory Surgery,' Beverly K Philip, and colleagues at the Brigham and Women's Hospital in Boston, Massachusetts, compared the costs of two anaesthetic techniques in ambulatory gynaecological procedures. They calculated that maintenance of anaesthesia with propofol was approximately $10 more expensive than comparative anaesthetic maintenance with isoflurane (5 l min^{-1} in semi-closed system) in patients anaesthetized for approximately 50 min.

Early recovery (i.e. awakening or sitting in chair) was more rapid after propofol, but time to home readiness was similar after both techniques. Of the patients who felt nauseated, 27% were in the propofol group and 29% in the isoflurane group.

Comments: There was uncertainty among the discussants about whether the faster, early recovery (first stage recovery) can be translated into actual cost savings. This will depend on resource management abilities of individual health care institutions. Similar comparisons are indicated for maintenance of anaesthesia with desflurane and later with sevoflurane. The costs of low-flow (or closed-system) inhalation techniques also should be included in comparisons.

Richard S Gahn, and colleagues at St Louis University, St Louis, Missouri, presented a poster on 'Discharge Criteria for Outpatients Following Axillary Brachial Plexus Blockade.' They retrospectively followed up charts of 153 patients who underwent outpatient upper extremity surgery using brachial plexus blockade with mepivacaine.

Patients had been discharged home using the customary discharge criteria, but with an intact and working axillary plexus block. Patients were advised at the time of discharge that the sensory and motor functions in their extremity were not normal, and the hand was placed in a sling. None of the patients noted any injury occurring during the period of the blockade, and the authors felt that such a discharge practice is safe.

Comments: The discussants felt that problems related to the retrospective nature of this study prevented the results from being conclusive. Although a number of outpatient programmes feel that the practice is safe, others are uncomfortable about sending patients home with working blocks because of possible liability if accidents do occur after discharge. It appears that it is important to follow previously set discharge policies for each institution.

Carolyn P Greenberg, New York, moderated the scientific oral paper session where several interesting papers were presented. Jeffrey L Apfelbaum, University of Chicago Hospitals, Chicago, Illinois, presented the results of a large multicentre trial on 'Characteristics Associated with Prolonged Time to Awakening after Propofol Maintenance Anesthesia—Initial Experiences of 1819 Physicians.' In this unique study many physicians administered propofol for the first time in their practice, either as repeated bolus injection (8161 administrations) or continuous infusion (7325 administrations).

The authors attempted to identify factors related to prolonged awakening, defined as > 15 min. Prolonged awakening tended to be associated with increasing age, poor physical status, increasing propofol dose (> 8 mg kg^{-1}) and concomitant use of benzodiazepines.

Comments: The speaker stressed the importance of continuing the study to find out if the prolonged awakening time experienced by 7.5% of patients is a property of the drug or is a reflection of the physicians' learning curve. This reviewer would like to see

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0966-6532/93/010041-02

other endpoints measured as well (e.g. time to ambulation or to home readiness).

A total of 21 papers were presented on ketorolac, the relatively new nonopioid analgesic (nonsteroidal anti-inflammatory drug, NSAID). Depending on the conditions of the study, ketorolac was reported to provide analgesia similar or inferior to narcotic analgesics such as morphine or fentanyl. Hak-Yui Wong, and colleagues from Northwestern University Medical School, Chicago, Illinois and Virginia Mason Medical Center, Seattle, Washington, presented 'Evaluation of Ketorolac as Sole Analgesic after Outpatient Surgery.' They studied 231 patients undergoing a variety of procedures. After surgery, patients received ketorolac 30 mg IV twice at 15-min intervals followed by 10 mg IV, p.r.n. up to six doses followed by 10 mg orally every 4 to 6 hours at home. In a similar fashion, control groups received fentanyl (either 10 or 50 μg IV) in the recovery room and codeine (60 mg) plus acetaminophen 600 mg every 4 to 6 hours after discharge.

The results suggest that except for the initial lag of analgesic action (i.e. approximately 30 min), the ketorolac IV followed by oral ketorolac provided analgesia similar to that found in the fentanyl groups. In this study, ketorolac was associated with lower incidence of the side effects of nausea, somnolence and impaired bowel function, which would be an advantage in the outpatient setting.

Yifeng Ding, and Paul F White, both of the University of Texas at Dallas, Texas, reported on a well-performed study on 'Use of Ketorolac and Fentanyl during Ambulatory Surgery.' Patients undergoing minor gynaecological surgery were given a blinded intravenous injection of either fentanyl 100 μg, ketorolac 60 mg, or the combination of these two prior to induction of anaesthesia.

In the ketorolac group, 68% of patients needed supplementary fentanyl for pain as a rescue medication, compared to only 13% of patients in the fentanyl group, and 14% in the combination group. No differences were noted in side effects or any of the recovery parameters measured (e.g. awakening, ambulation, discharge).

In an excellent presentation entitled 'No Fentanyl Sparing Effect of Intraoperative IV Ketorolac After Laparoscopic Tubal Ligation,' Carmen R Green, from the University of Michigan Medical Center, Ann Arbor, Michigan, concluded there was no significant narcotic sparing effect in prevention of pain after laparoscopic tubal ligation with a ring method using IV ketorolac 30 or 60 mg.

All patients received fentanyl 2 μg kg^{-1} at the time of induction of anaesthesia. In addition, approximately 30 min before the end of the procedure, the anaesthesiologist gave a 2 ml solution IV containing either saline, ketorolac 30 or 60 mg. There were no significant differences in requirement of fentanyl or later oral analgesics for pain in the recovery room or at home. Likewise, there were no major differences in emergence or recovery from anaesthesia (i.e. in time to ambulate or discharge home) or in the incidence of postoperative nausea and vomiting.

Comments: In this study, a ring method was used to tie the tubes. Pain is less severe after using a clip method for tubal ligation (Filschie clips). Ketorolac is the first injectable NSAID available in the United States. Several other NSAIDs (e.g. dicolfenac sodium, ketoprofen) have been used in Europe for years. Earlier studies with these other NSAIDs and new studies presented at the ASA Annual Meeting on ketorolac appears to indicate that NSAIDs, including ketorolac, may be sufficient to prevent or treat mild to moderate postoperative pain, but they would not be good enough to replace narcotic analgesics in the prevention or treatment of severe postoperative pain.

S Goegler, and colleagues at the Technical University, Munich, Germany, carried out a study on 'Pulmonary Function Following Laparoscopic Cholecystectomy Versus Laparotomic Cholecystectomy.' Although there was some evidence that pulmonary function was less impaired after the laparoscopic method, the authors demonstrated a distinct decrease of several parameters of pulmonary function and oxygenation when compared to values obtained before operation.

Comments: It appears one should not have a false sense of security that pulmonary function is not impaired after laparoscopic cholecystectomy.

Six papers dealt with ondansetron, a new 5-HT_3 receptor antagonist, in the prevention or treatment of postoperative nausea and vomiting (PONV). Charles B Hantler, Texas Health Sciences Center, San Antonio, Texas, presented a multicentre study entitled 'Ondansetron Treats Nausea and Vomiting Following Surgery.' This study, which was carried out in 25 different centres, compared placebo to ondansetron 1, 4 and 8 mg in 500 patients who developed PONV after different types of ambulatory surgical procedures.

The main endpoint in the study was the number of patients whose PONV did not reappear after a study drug. The complete response (i.e. the patients who did not develop PONV after the first episode of PONV and after the study drug) was 26% in the placebo group and 40, 44 and 41% in ondansetron 1, 4 and 8 mg groups, respectively.

Eli Alon, and S Himmelseher, University Hospital, Zurich, Switzerland, presented a paper, 'Evaluation of Ondansetron, Metoclopramide and Droperidol for the Prophylaxis of Emetic Symptoms after Minor Gynaecological Surgery.' They gave a prophylactic dose of either ondansetron 8 mg, metoclopramide 10 mg or droperidol 1.25 mg to 66 patients undergoing minor gynaecological surgery with thiopental-enflurance-nitrous oxide-oxygen-alfentanil anaesthesia. Approximately 13% of patients vomited after ondansetron, 44% after droperidol and 53% following metoclopramide administration.

Comments: Ondansetron is an expensive new drug. Further studies are needed to compare the efficacy and side effects of ondansetron with other active drugs.

Frances F Chung, University of Toronto, Ontario, Canada, and Surinder K Kallar, Medical College of Virginia, Richmond, Virginia, presented their experiences with the use of a new and interesting recovery scoring system. In their paper, 'Practical Applications of Postanesthetic Discharge Scoring System — PADS,' they compared the customary clinical criteria for discharge from PACU with discharge guided by PADS in 300 patients.

The authors found that an average total duration of postanaesthesia care unit stay was shorter using the PADS (83 ± 29 min) versus discharge by the clinical criteria (98 ± 29 min). When compared with clinical criteria, however, 40 patients were considered to be ready for discharge at a later time (9 ± 10 min later) using the PADS scoring system. The authors intend to delete voiding as one criteria for discharge in the PADS score and to carry out more studies to determine how applicable the PADS scoring is as a guideline for discharge in current outpatient anaesthesia practice.

Kari T Korttila,
Associate Professor of Anaesthesia,
University of Helsinki Women's Hospital,
Helsinki, Finland

Congress report

The Hague: 10th World Congress of Anaesthesiologists: Panel on Ambulatory Care

Anaesthesiologists from every continent and almost every country in the world participated in the 10th World Congress of Anaesthesiologists held 12–19 June, 1992 in The Hague, The Netherlands. One of the highlights of this enormous conference, which takes place once every 4 years, was the Panel on Ambulatory Care.

The chair of the panel was J R Nocite, from Ribeirao Preto, Brazil. The panel consisted of Jeffrey L Apfelbaum, University of Chicago; Kari T Korttila, University of Helsinki, Finland; J Raeder, Baerum, Norway; and Sujit K Pandit, University of Michigan.

In his introductory comments, Dr Nocite stated that the main objective of ambulatory care is cost containment, a particularly important consideration in developing countries. He pointed out that the United States and Canada are the leaders in the development of ambulatory surgery, where at present up to 60% of all surgeries are done as outpatient procedures.

Jeffrey L Apfelbaum presented the topic, 'Patient and Procedure Selection.' He commented that in the United States this year, for the first time, the total number of outpatient surgical cases will exceed the number of inpatient cases. He described his freestanding outpatient surgery facility (built on the ninth floor of a shopping mall in Chicago). Dr Apfelbaum pointed out that in sharp contrast to 20 years ago when a patient may have spent 3 days in the hospital for a minor operation, for that same operation today, the patient might spend as little as 1 hour in the freestanding surgery facility.

Dr Apfelbaum described another innovation in outpatient surgery, freestanding recovery room care. He noted that patients might spend up to 72 hours following complicated outpatient surgery in such facilities like the one in Fresno, California. This facility has a very high (compared to standard postoperative ward) nurse-to-patient ratio up to 1 : 5, as well as luxurious accommodation with dining arrangements.

Quoting studies by Meridy, Natoff and Wetchler, Dr Apfelbaum stated that increasing age or ASA physical status does not increase the complication rate after outpatient surgery. On the other hand, he cautioned that certain patients may not be suitable candidates for outpatient surgery (e.g. those with morbid obesity with concomitant disease, a history of acute substance abuse, susceptibility to malignant hyperthermia or those receiving monoamino oxidase inhibitors).

Moreover, patients who are either unable or unwilling should not be forced to undergo outpatient care. Infants who are born premature and are less than 45 weeks of conceptual age likewise are unsuitable for outpatient surgery. This is also true of infants with a history of apnoeic spells, failure to thrive or symptomatic children with pulmonary dysplasia.

In addressing the question of preoperative assessment in these patients, Dr Apfelbaum emphasized the importance of screening, evaluation and preparation of these patients ahead of time to avoid a high incidence of cancellation rate on the day of surgery. He described how a hand-held computer is being used in his institution as a simple and inexpensive screening device. The patient is asked 160 simple questions that an average patient can answer in 8 minutes. The computer then summarizes the important positive findings and suggests appropriate laboratory tests.

Kari T Korttila spoke on 'Recovery and Discharge after Outpatient Surgery.' He first described three levels of recovery: early recovery or emergence from anaesthesia; intermediate recovery when the patient is ready for discharge; and late recovery when the patient recovers completely at home. His primary focus was on intermediate recovery, noting that the patients need not be 'street fit'; rather, they should be simply 'home ready' before discharge. He also noted that there are no good psychomotor or laboratory tests to assess home readiness at the bedside. He suggested that discharging patients following certain clinical criteria is reliable and safe.

Dr Korttila next discussed the important question: who should discharge the patient? He suggested that the recovery room nurse can discharge the patient safely as long as the nurse follows a set of discharge criteria approved by the anesthesiologist. The discharge criteria should include: stable vital signs; absence of any surgical complications like bleeding; minimum nausea and vomiting; minimum postoperative pain; and the ability to ambulate, retain oral fluids and void. The criteria of being able to retain oral fluids and to void are being questioned as to whether they are really necessary. According to Dr Korttila, voiding criteria is important after spinal and epidural anaesthesia.

The factors that are known to increase discharge time are: duration of surgery, type of anaesthesia, presence of nausea and vomiting and postoperative pain. He referred to several papers that suggest propofol anaesthesia decreases discharge time not only because it is eliminated fast but also because of its ability to minimize nausea and vomiting. Desflurane, a new volatile anaesthetic with very low blood-gas solubility, has a similar ability to shorten discharge time.

Dr Korttila emphasized the importance of documentation and the importance of an escort to accompany the patient home, someone who will stay with the patient overnight. Patients should be advised against driving or operating complicated machinery within 24 hours of surgery. The common causes of unanticipated hospital admission after outpatient surgery are extensive surgery, nausea and vomiting, postoperative pain and social reasons (e.g. absence of an escort).

The next speaker, J Raeder, discussed 'Is Regional Anesthesia Appropriate for Outpatient Surgery?' He began by noting reasons that are commonly given for regional anaesthesia being inappropriate in outpatient surgery. These include: patient safety, the patient's willingness to accept regional anaesthesia, difficulty in initiating regional anaesthesia, time taken to

Reprinted with permission from *Ambulatory Anesthesia*, the Official Newsletter of the Society for Ambulatory Anesthesia, Volume 8, Number 1.

0966-6532/93/0100043-02

initiate regional anaesthesia and fear of postspinal headache. By quoting many studies, Dr Raeder argued that none of the objections is valid. In fact, several studies of inpatients indicate that regional anaesthesia is safer than general anaesthesia because it reduces surgical stress, decreases blood loss and minimizes the incidence of deep venous thrombosis. Other studies show that if patients are properly prepared, they readily accept regional anaesthesia. In two studies that surveyed the anaesthetic preferences of practising anaesthesiologists and recovery room nurses, both groups overwhelmingly preferred regional anaesthesia over general anaesthesia for themselves.

Dr Raeder proposed that regional anaesthesia should not take longer than general anaesthesia if properly planned (i.e. initiated in the holding room). Furthermore, there is significant time saved at the end of surgery because patients are ready to be moved to the recovery room immediately after completion of surgery under regional anaesthesia, which is not the case after general anaesthesia. Several studies have also shown that discharge time after epidural anaesthesia with catheters using short-acting local anaesthetic agents is, in fact, shorter than after general anaesthesia.

Postspinal headache remains a problem in young patients undergoing outpatient surgery under spinal anaesthesia. Dr Raeder pointed out, however, that new pencil-point needles like 27-gauge Whitacre or 25-gauge Sprotte have reduced the incidence of postspinal headache to a very acceptable level even in young patients.

Dr Raeder concluded by pointing out several advantages of regional anaesthesia for outpatient surgery. They include: better blockage of nociceptive reflexes, better postoperative pain control, ability to communicate with the patient during the operation, low incidence of postoperative nausea and vomiting, and significantly lower cost.

Sujit K Pandit addressed the topic 'Complications and Quality Assurance in Ambulatory Anesthesia.' Dr Pandit pointed out that the incidence of so-called 'minor side effects' after general anaesthesia are in fact quite high and are considered as 'complications' by the patient and the attendant at home. Thus, patient education about the side effects of anaesthesia is very important. By citing several studies, Dr Pandit showed that the two most common anaesthesia-related causes of unanticipated hospital admission after outpatient surgery are intractable nausea/vomiting and unrelieved postoperative pain.

The variable incidences of postoperative nausea and vomiting can be attributed to multiple confounding factors, including patient characteristics, type of operation, usage of narcotics and type of anaesthesia. He emphasized that general measures like 'smooth and elegant' anaesthesia by an experienced anaesthesiologist and scrupulous attention to detail during and after the operation are most effective in reducing postoperative nausea and vomiting.

Dr Pandit mentioned that widespread use of propofol anaesthesia has substantially lowered the incidence of postoperative nausea and vomiting. Nevertheless, at times, the use of a prophylactic antiemetic is needed. Among the multitude of antiemetic medications, droperidol and metoclopramide are the most commonly used in the United States. Yet, there are still raging controversies about their efficacy, appropriate dosage, time and route of administration, and side effects. Although ondansetron, a new 5 HT_3 blocker antiemetic drug, seems to be devoid of many of the side effects of droperidol, it is very expensive.

Postoperative pain control remains a significant challenge after outpatient surgery. Dr Pandit recommended an approach based on the concept of 'balanced analgesia.' This approach might include a small dose of a narcotic, a nonsteroidal anti-inflammatory agent like ketorolac, and liberal usage of local anaesthetic agents in the form of either local infiltration or regional analgesia. Pre-emptive use of analgesics is considered beneficial. There are several innovations to postoperative pain control on an ambulatory basis on the horizon; they include ambulatory patient-controlled analgesia, continuous subcutaneous infusion of analgesics, transdermal route of analgesics and home nursing care.

Dr Pandit ended his presentation by describing current methods of quality assurance in outpatient surgery centres, based on the concept of 'total quality improvement.' This is a process of evaluating the system with a continuous attempt to improve quality rather than a policing action of finding faults and taking remedial actions.

During the question-and-answer session, the panelists were asked about the current guidelines on nulla peros (nothing by mouth) status. All panelists agreed that change is needed in our current practice of arbitrarily ordering nulla peros (nothing by mouth) after midnight. Several studies have shown that for healthy ASA 1 or 2 patients (both adults and children) undergoing elective surgery, an unrestricted amount of clear liquids can be and should be given up to 3 hours before induction of anaesthesia as this may be beneficial.

Another question was asked regarding how necessary it was to develop the new expensive antiemetic drugs. Dr Pandit replied that although the incidence of nausea and vomiting is steadily declining, we still have an occasional case of intractable vomiting where a reliable rescue medication is required before the patient can be sent home.

Uma A Pandit
Clinical Associate Professor of Anesthesiology,
University of Michigan School of Medicine,
Ann Arbor, Michigan, USA

Ambulatory Surgery 1993; **1**: 45–47

Literature review

Section Coordinators:
Frances Chung, The Toronto Hospital, Toronto, Canada
Peter M N Y H Go, Maastricht University Hospital, Maastricht, The Netherlands

Economic impact of anaesthesia decision making: they pay the money, we make the choice

Bernard V Wetchler

J Clin Anesth 1992: **4**, No. 5 (suppl I): 20S–24S

This paper stated that cost must enter into quality-of-care decision making for physicians and other health care providers. However, anaesthesiologists should not allow cost to be the overriding factor in determining the choice of an anaesthetic drug or a particular technique. The choice of anaesthetic drugs might affect the patient in both the operating room (OR) and the postanaesthesia care unit (PACU) and how rapidly the patient could return to normal activities at home and in the workplace.

The author indicated that three criteria of assessment should be applied to any new anaesthetic:

(1) Is the new agent sufficiently better than currently available anaesthetics?
(2) Are there added costs associated with the use of the new anaesthetic?
(3) Are there potential cost savings that could result from decreased patient morbidity, and duration of PACU stay by using the new drug?

Dr Wetchler suggested that we should think in terms of both direct and indirect costs. Direct costs included not only the cost of the anaesthetic but the additional cost of adjuvants, equipment, and drug waste. Indirect costs took into consideration the OR turnover time between cases – how quickly and safely the patient could be moved from the OR to the PACU; length of stay in the PACU; intensity of PACU care needed; and equipment maintenance. For ambulatory surgery patients, anaesthesia-related unanticipated hospitalization should be considered as an indirect expense. Patient satisfaction should also be taken into account. To achieve savings, PACU discharge must be geared to scoring systems for discharge criteria rather than designated time spent in the recovery area. The conclusion was that cost-effective quality care should be provided, and that each anaesthesiologist must give thought to becoming prudent providers.

Comments
New anaesthetic drugs in induction agents, inhalational anaesthetics, neuromuscular relaxants and local anaesthetics are available. They are generally more costly than the existing available anaesthetic drugs. This article addresses the timely issue of cost-effective quality care in outpatients, and asks us to examine the role of each new anaesthetic drug in the practice of anaesthesia. New anaesthetics must offer unique and important benefits to patients, to anaesthesiologists and to the health care system in order to warrant wide-spread incorporation into clinical practice.

FC

Comparative effect of ketorolac, dezocine and fentanyl as adjuvants during outpatient anaesthesia

Yifeng Ding, Paul F White

Anesthesia & Analgesia 1992; **75**: 566–71

Ketorolac, a non-steroidal, anti-inflammatory drug that inhibits prostaglandin synthesis, is alleged to have comparable analgesic efficacy to morphine when administered for postoperative pain relief. Dezocine is a partial μ-receptor agonist that is slightly more potent than morphine when used for postoperative pain relief. In this study, the comparative effects of ketorolac, dezocine, and fentanyl were evaluated in 136 healthy female patients undergoing outpatient laparoscopy procedures. Patients received ketorolac (60 mg) or dezocine (6 mg) or fentanyl (100 μg) before the start of the operation.

In the postanaesthesia care unit, 61% of patients in the fentanyl group received analgesic drugs for persistent pain, compared with 34% and 25% in the ketorolac and dezocine groups, respectively. Similarly less postoperative fentanyl was required in the ketorolac and dezocine groups, compared with the fentanyl group. However, 52% of the patients receiving dezocine required anti-nausea therapy compared with 20% and 18% in the fentanyl and ketorolac groups, respectively. Recovery times were significantly shorter in the ketorolac group. The authors concluded that both ketorolac and dezocine were effective alternatives to fentanyl. However, dezocine was associated with an increased incidence of postoperative nausea and a delayed discharge time compared with ketorolac.

Comments
The results of this study suggest that ketorolac will be a useful intraoperative analgesic. Patients have less postoperative pain, require less postoperative analgesics, and have more rapid recovery. Dezocine seems to be less suitable as it is associated with an increased incidence of postoperative nausea. These findings suggest that ketorolac should be part of the armamentarium of anaesthesiologists.

FC

0966-6532/93/010045-03

Efficacy of preadmission testing in ambulatory surgical patients

R Golub, R Cantu, JJ Sorrento, HD Stein

Am J Surg 1992; **163**(6): 565–70; discussion 571

A retrospective study was done with 325 patients who had preadmission testing prior to ambulatory surgery. At least one laboratory abnormality was noted in 84% of the patients. The serial multiple analysis (SMA)-7 was abnormal 63% of the time. Abnormalities were seen in 54% of the SMA-12 panels and 38% of the urinalyses performed. Twenty four per cent of the patients treated had an abnormal electrocardiogram (ECG). An abnormal chest roentgenogram was found in 19% of the patients. Only three (1%) patients potentially benefited from preadmission testing. Ninety-six per cent of the abnormal laboratory results were ignored by the attending physicians. Therefore, we conclude that preadmission testing should be done on a selective basis. Patients older than 50 years of age should have an ECG. A haematocrit should be obtained only if major blood loss is anticipated. All other tests should be ordered based on the history and physical examination.

Comments
Patients eligible for ambulatory surgery usually have ASA 1 or 2 classification. For ASA 1 and 2 patients very little preadmission testing is necessary. This has been found before for inhospital patients. The paper is important in demonstrating that no other policy is necessary in ambulatory surgery. It will help surgeons and anaesthetists to limit 'defensive' tests. One of the major reasons to support ambulatory surgery is cost reduction in health care. This paper promotes even more cuts in expenditure.

PG

Intra-articular morphine, bupivacaine, and morphine/bupivacaine for pain control after knee videoarthroscopy

George F Khoury, Andrew CN Chen, Douglas E Garland, Christoph Stein

Anesthesiology 1992; **77**: 263–6

Opioid analgesia has been associated with activation of opioid receptors within the central nervous system. Evidence has also accumulated that exogenous as well as endogenous opioids can produce pronounced anti-nociceptive effects by interacting with opioid receptors in peripheral tissues. Thus low doses of intra-articular morphine, injected at the completion of arthroscopic knee surgery, can produce relatively long-lasting postoperative analgesia apparently via activation of local opioid receptors in the knee joint. The authors studied 33 patients who received either morphine (1 mg 20 ml^{-1} NaCl $n = 11$), bupivacaine (20 ml 0.25%; $n = 11$), or a combination of the two ($n = 11$) intra-articularly at the completion of the surgery. After 1, 2, 3, and 4 h and at the end of the first and second postoperative days, pain was assessed by a visual analogue scale, and supplemental analgesic requirements were recorded.

Pain scores were significantly greater in the morphine group than in the other two groups at 1 h. There were no significant differences at 2 and 3 h. From 4 h until the end of the study period, pain scores were significantly greater in the bupivacaine group than in the other two groups. Analgesic requirements were significantly greater in the morphine group than in the other groups at 1 h but more significantly greater in the bupivacaine group than in the other groups throughout the remainder of the study period. The authors showed that in patients having undergone arthroscopic surgery, intra-articular bupivacaine yields postoperative analgesia of immediate onset but only of short duration (2–3 h), whereas intra-articular morphine produces an analgesic effect of delayed onset, about 2 h post injection, but of remarkably long duration. The combination of these two drugs results in satisfactory analgesia throughout the entire observation period.

Comments
Postoperative pain is one of the most common complaints in ambulatory surgery. Persistent pain is also one of the causes of unanticipated admission. This exciting clinical study demonstrated the effectiveness of intra-articular morphine in inhibiting postoperative pain by activation of peripheral opioid receptors within the joint. Thus the practical application of the combination of intra-articular morphine and bupivacaine will enable more complicated joint surgery to be done on an outpatient basis.

FC

Outpatient open cholecystectomy

EC Saltzstein, LC Mercer, JB Peacock, SH Dougherty

Surg Gynecol Obstet 1992; **174**(3): 173–5

A prospective study to evaluate discharge of patients from the hospital the day of open cholecystectomy was performed. Patients were selected for outpatient operation if they were less than 55 years of age, did not undergo exploration of the common bile duct and had no significant co-morbidity. During a six month period, 94 consecutive patients underwent cholecystectomy. Forty-four of 64 eligible patients were discharged on the day of operation. Patients were walking and receiving oral liquids soon after operation. Marcaine (bupivacaine hydrochloride) was injected subfascially in all patients and vertical incisions were used in 34 of 44. One patient required readmission for 12 hours, three days after operation. The satisfaction rate was high and the patients returned to their usual activity in seven to 21 days. Outpatient open cholecystectomy is safe, and appropriate therapy and the data established a standard with which to compare that of laparoscopic cholecystectomy.

Comments
Many papers on laparoscopic cholecystectomy claim that the laparoscopic procedure reduces the operative morbidity so much that this procedure can be done as an outpatient procedure. A laparoscopy is less traumatizing than a laparotomy. Saltzstein et al. shows that in selected patients the open cholecystectomy can be performed safely as an outpatient procedure. Surgeons had never thought of doing this in the era before laparoscopic cholecystectomy. This paper should not advocate an outpatient procedure for open cholecystectomy, but emphasize that more factors exist than laparoscopy alone leading to early patient discharge from the hospital. This

includes a different attitude towards outpatient procedures. Surgeons, anaesthetists, nursing staff and patients have to adjust so that more procedures can be done safely as outpatient procedures or ambulatory surgery than traditionally was believed or assumed possible.

PG

Outpatient surgery: Why? How?
(Original title: La chirurgie ambulatoire. Pourquoi? Comment?)

LF Hollender

Bull Acad Natl Med 1991 **175**(7): 995–1001

One-day surgery – defined by the fact that the patient enters the clinic in the morning and returns home late in the afternoon – requires the observation of a whole range of criteria which are absolutely necessary to guarantee the highest possible security. At first an outstanding collaboration with the anaesthetist is mandatory. Material conditions of its practice should not be neglected. Rooms and medical staff have to be appropriate. Indications of its performance are large but depend on the experience of the surgeon. Limits are ruled by the general status of the patient and also by his social conditions and his surroundings, not forgetting excellent collaboration with the general practitioner. Economic advantages seem obvious but have to be calculated. It is above all necessary to persuade the public hospital administrations and the social security structures, of the interest and the advantages of one-day surgery.

Comments
Most reports on ambulatory surgery originate from authors familiar with the English literature. This paper shows that ambulatory surgery has gained interest in France as well. The abstract starts with a clear definition of one-day surgery. This is important, because one-day surgery might vary from removal of a sebaceous cyst to a laparoscopic cholecystectomy, where the patient is discharged from the hospital within 24 hours after the procedure. It is obvious that these definitions influence the percentage of procedures that can be done in ambulatory surgery. Hospital administrators and health insurance companies tend to base their calculations on these percentages. In addition, the abstract summarizes the core elements for initiating successful ambulatory surgery.

PG