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Editorial

More ambulatory surgery—Is it worth doing?

Worldwide, we are seeing ever-mounting interest and pressure to increase the percentage of procedures performed as ambulatory surgery. Is it worth it? We need to assess the value of such an approach, and for ambulatory surgery, two indicators of value are quality and cost. Do we lose quality in exchange for increasing productivity? Do we actually reduce the use of resources?

Several papers in this volume look at these questions. Martin López et al. studied the development of ambulatory surgery in their hospital. They noted the increase in percentage of ambulatory surgery from 22% in 1994 to 53% in 2001, caring for over 15 000 patients. During those years, the medical complexity of their DSU patients also increased, as measured by percentage of patients who were ASA Status ≥ 2. How does one assess whether this growth resulted in the maintenance of quality of care provided to the patients? One of the central indicators of quality in ambulatory surgery is whether the patients indeed can go home. Martin López et al. reviewed both early admissions (patients not discharged) and late admissions (patients re-admitted) in their population. They found that there had been no increase in the admission rates over that time, staying at around 1.6% This is a very respectable admission rate, and the authors should be congratulated for this indicator of stable quality care.

How can we generalize the lesson shown here, and even go one step further? If we are to know how well we are doing, it is imperative that we collect outcomes data in each of our facilities. This is especially important message for our colleagues who are in the early stages of setting up an ambulatory surgery program, who should integrate this activity from the very beginning as a fundamental management function. First, we need to know about significant undesired events, also known as critical incidents. An example is reintubation of a patient in the PACU. These occurrences should be rare, and each incident should be analyzed. However, we must also develop a program of ongoing continuous quality improvement. This addresses the expected, common minor adverse outcomes associated with ambulatory anesthesia and surgery. An example is the rate of vomiting. We need to review these data regularly to assess ongoing the quality of our care. Optimally, these data should be collected by procedure and by practitioner—anesthesiologist, surgeon and nurse. We all contribute to these outcomes. The individual data should be given to each practitioner, in a secure fashion, to allow them to evaluate their care and improve their practices.

The second half of "is it worth doing?" is the question of economics. Increasing the percentage of operations done as ambulatory surgery should save the healthcare system money, and allow us to care for more patients with the same amount of resources. Theoretically, but does it happen? In this issue Lemos et al. studied two groups of patients who were scheduled to undergo tubal ligation at their hospital. All were candidates for ambulatory surgery, but half-received inpatient and half ambulatory care. The authors measured the costs, and found that there was an average actual saving of 62% for each procedure performed as an outpatient. Furthermore, they extrapolated these measured savings to project the money saved if all such procedures at their hospital that year had been done as ambulatory surgery. Their answer, for just 181 procedures, was an impressive €107 372.82.

We could extrapolate further to the conversion of all conservatively appropriate operations to be done as ambulatory surgery. The savings to each country's healthcare system would be truly enormous. We should bring similar cost data, with demonstrations that quality of care is indeed maintained, to our countries' Health Ministers, to enthusiastically encourage the use of ambulatory surgery for the benefit of our patients.

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Regional anaesthesia in the outpatient treatment of bilateral inguinal hernias using totally extraperitoneal laparoscopy

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Abstract

The treatment of bilateral inguinal hernias using totally extraperitoneal laparoscopy is usually done with general anaesthesia. The objective of this article is to evaluate the regional anaesthesia technique in extraperitoneal laparoscopic surgery for treating bilateral inguinal hernias in an outpatient surgery unit. Prospective clinical study of 30 patients with uncomplicated bilateral inguinal hernia undergoing surgery using extraperitoneal laparoscopy. The anaesthesic technique used were spinal regional anaesthesia. We analysed clinical data (age, sex, associated diseases, prior abdominal surgery, site and hernia type), intra-operative complications (bleeding, peritoneal rupture, subcutaneous emphysema, reconversion rate, haemodynamic stability, respiratory problems and degree of satisfaction), postoperative complications (haematomas, urinary retention, post lumbar puncture headaches, nausea, vomiting and postoperative pain) and recurrence rate. All the patients undergoing surgery under-spinal anaesthesia in any case was necessary to reconvert it to general anaesthesia. In conclusion, regional anaesthesia is safe and efficient in an outpatient surgery unit in the treatment of bilateral inguinal hernias.

Keywords: Bilateral inguinal hernia; Regional anaesthesia; Totally extraperitoneal laparoscopy; Day surgery

1. Introduction

The regional anaesthesia is the anaesthetic technique elected to treat inguinal hernia. The laparoscopy technique used to treat that patology has modified this concept because it is performed under general anaesthesia. In theory, the extraperitoneal way carried out by laparoscopy, reproduce the same steps than conventional parietal surgery without violation of the intraabdominal cavity, therefore, can be suggested that, this technique can be made correctly under spinal anaesthesia. The aim of this work is to analyze the viability of this anaesthetic-technique, to treat bilateral inguinal hernia under extraperitonel laparoscopy. The laparoscopic technique for the treatment of inguinal hernias was introduced as a less invasive method for repairing the defect and solving the problem, in addition to offering greater patient well-being [1–6]. The surgical technique has gradually become less aggressive, progressing from a purely intra-abdominal laparoscopy to the transabdominal technique but with preperitoneal repair and today to the totally extraperitoneal technique without altering the abdominal cavity [7]. However, until now, the usual way to perform this laparoscopic technique has been with general anaesthesia [8,9]. It might, therefore, seem a contradiction to try to solve a problem with minimally invasive surgery but with possible major anaesthetic aggression, more so if we consider that conventional surgery is being performed more and more with locoregional anaesthesia techniques. The present study is designed to demonstrate that the subarachanoid spinal anesthesia is another possibility for totally extraperitoneal laparoscopic repair of inguinal hernias, and attempts to show which of them may be more beneficial for the patient and the surgeon.

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2. Material and methods

2.1. Patients

Thirty patients with bilateral inguinal hernia, diagnosed in the outpatients department of the J. Ma Morales Meseguer University Hospital in Murcia, underwent surgery using totally extraperitoneal laparoscopy and spinal anesthesia. The surgery was performed by one surgeon (A. Moreno-Egea) on a day-surgery basis (without hospital admission). Criteria for exclusion from laparoscopic surgery were femoral hernias, incarcerated hernias, inguinoscrotal hernias, Nyhus types I and patients aged under 20 years. Criteria for exclusion from spinal anaesthesia, apart from the contra-indications inherent in this technique (hypovolaemia without correction, coagulation problems and local or general acute infection) were patient refusal, the presence of central or peripheral neurological pathology, pathology of the spinal column, ASA III–IV, intellectual limitations and lack of collaboration.

2.2. Anaesthetic technique

All the patients received premedication at the Surgical Day Hospital with an oral benzodiazepine (diazepam 5–10 mg or lormetazepan 1 mg). Eight patients were given an anti-H_2 (i.v. ranitidine) and an anti-emetic (i.v. metoclopramide) because the presence of a hiatus hernia. The procedure began with the establishment of a sterile field and the identification of anatomical landmarks in a theatre fully equipped for patient monitoring. Spinal anaesthesia was performed with the patient on the operating table in the lateral decubitus position with the surgical side down. The puncture was made with a whitacre needle 25–27 g through L2–L3 or L3–L4 intervertebral space and 12–13 mg of hyperbaric–bupivacaine 0.5% plus 15–25 mg of fentanyl according to the height of the patient was injected. The patient was placed in the supine position, changing the position of the operating table (using different degrees of Trendelenberg), in order to obtain the level of anaesthesia around D6 which is the necessary level for patients comfort. This was tested with ethyl chloride. This group of patients had been sedated with midazolam (0.025 mg/kg) previously. Several patients [9] were also premedicated with atropine (0.5 mg). If during the procedure the peritoneal sac was ruptured a propofol infusion at a rate of 0.8–1.2 μg/ml was started and a 100 μg fentanyl bolus was given. In all the patients 2 g of metamizol was given very slowly. Before the procedure ended the surgeon put into the preperitoneal space 20 ml of ropivacain 0.375% and the skin incisions were infiltrated.

2.3. Surgical technique

Three trocars were placed in the midline. A 1.5 cm horizontal incision was performed infraumbilically. The incision was carried down to the anterior rectus sheath, which was also incised. The rectus muscle was retracted laterally. A dissector balloon (SPACEMAKER® II Surgical Balloon Dissector; GSI, Inc. Cupertino, USA) was inserted behind the muscle and in front of the posterior rectus sheath. An end-viewing telescope was introduced into the device while the balloon was being insufflated. Two 5 mm trocars were placed, one just above the pubis and the other in the midline above it. The entire posterior floor was dissected and the anatomical landmarks recognized. Dissection proceeded laterally between the upper edge of the elements of the cord and the epigastric vessels. It was conducted laterally in the iliac fossa. In the case of external oblique hernias, (indirect) the sac was freed from the elements of the cord and pushed back. If the sac was digitiform, ligature may be indicated. In the case of direct hernias, the fascia transversalis was turned over, then fastened with a stapler at the level of the pubic symphysis, so as to prevent appearance of seroma that could resemble a false recurrence. A 10×15 cm multifilament polyester mesh (Parietex®, Prim S.A., Sofradim, Villefranche sur Saone, France) was used to overlap the defect widely and fixed with two or three staples to the Cooper ligament (Tacker®; Origin, California, USA). Once correct positioning of the prosthesis and haemostasis had been checked, exsufflation of the extraperitoneal space was commenced and the peritoneal sac collapsed over the mesh. The trocars were removed under direct vision [10].

2.4. Follow-up

All the patients were included in an assessment protocol during their hospital stay and afterwards at outpatient consultations at 1 week, 1 month, 6 months, 1 year and then yearly (clinical consultation and physical examination). The parameters analysed were: (a) clinical: age, sex, associated diseases, prior abdominal surgery, hernia site and type according to the Nyhus classification; (b) intra-operative complications: preperitoneal bleeding, rupture of the peritoneal sac, subcutaneous emphysema, rate of reconversion, haemodynamic stability (TANI and FC), respiratory problems (pulsoximetry and respiratory rates) and degree of satisfaction; (c) postoperative morbidity: haematomas, urinary retention, transitory pain, postoperative vomiting and nausea; and (d) in the follow-up: rates of readmission and recurrence. Follow-up averaged a minimum of 12 months and was complete in 100% of the patients.

Table 1
General characteristics of patients undergoing surgery using the extraperitoneal laparoscopy technique

	Regional anesthesia ($n = 30$)
Median age (range)	56.5 (25–76)
Sex (men/women)	29/1
Associated diseases	
Obesity	7 (23.3)
Prostatism	6 (20)
Cardiopathy	2 (6.6)
Diabetes Mellitus	4 (13.3)
Pulmonary diseases	11 (36.6)
Hiatus hernia	4 (13.3)
Surgical history	
Appendicectomy	4 (13.3)
Nephrectomy	1 (3.3)
Prostatectomy	1 (3.3)
Cholecystectomy	3 (10)
Herniorraphy	4 (13.3)
Type	
II	3 (10)
IIIA	12 (40)
IIIB	14 (46.6)
IV	1(3.3)

Data are expressed as absolute values, with percentages in brackets.

3. Results

The patient's characteristics are shown in Table 1. Bleeding inside the pre-peritoneal space was treated with local compression without any change in the anaesthetic technique previously chosen. Rupture of the peritoneal sac occurred in four cases (13.33%) but in no case was it necessary to convert spinal anaesthesia to general anaesthesia because of the pneumoperitoneum. The situation was resolved by increasing the degree of the patient's sedation (rate of conversion was 0%). The morbidity is shown in Table 2. Clinical changes during the procedure are shown in Table 3. The admission rate was zero. All the patients were discharged between 9 and 14 h post surgery. One patient developed urinary retention and was readmitted to the hospital for 2 days (3%).

Table 2
Clinical evolution of patients undergoing surgery with the laparoscopic technique under subarachanoid anaesthesia

Mean operative time	43 (30–65)
Intra-operative morbidity	
Preperitoneal bleeding	3 (10)
Rupture of peritoneal sac	4 (13.3)
Rate of reconversion	0
Readmission rate	1 (3.3)
Postoperative morbidity	
Haematomas	4 (13.3)
Urinary retention	2 (6.6)
Transitory pain	3 (10)
Recurrence rate	0

Data are expressed as absolute values, with percentages in brackets. Operative time is expressed in minutes.

4. Discussion

Inguinal hernia repair using the laparoscopic technique is gradually increasing in popularity, although it still accounts for less than 10% of all hernia operations in most countries, except Switzerland, where it represents 21% [11]. This new technique has proved to have certain advantages over the open approach, such as a smaller scar, less pain and physical disability, and less time off work. This last aspect may be of major social interest among patients belonging to the active population [3–6]. For us the laparoscopic technique is not a substitute for conventional surgery but an additional technique that complements the surgeon's therapeutic options and enables us to offer our patients a more complete and better-quality service. We believe that the technique should be performed according to the same anaesthetic and surgical principles as those accepted for open surgery. However, the standard method of performing laparoscopic surgery is with general anaesthesia, which might involve an added risk of respiratory complications (atelectasis, pneumonia, etc.), cardiovascular complications (anaesthetics can reduce the heart function and cause bradyarrhythmia, tachycardia and hypertension, etc.), gastro-intestinal complications (nausea, vomiting, bleeding, etc.) and urinary complications (urinary retention) [2,5,12,13]. For this reason general anaesthesia is usually considered to be contra-indicated in patients with multiple prior surgery, obese patients, those with chronic obstructive pulmonary disease, pregnant women, and patients with alterations in coagulation or portal hypertension [9]. Likewise, hernia patients often present with other diseases, and if we decide to offer them minimally invasive surgery as the best solution we should also be consistent with the anaesthesia technique we chose in order to offer an overall benefit. With this in mind, the extraperitoneal laparoscopic technique under regional anaesthesia means a reduction in the impact of CO_2 insufflation and fewer possible systemic complications, which is more in line with the anaesthetic standards of conventional surgery. Few studies have shown an improved outcome with the use of regional anaesthesia as against general anaesthesia. The present study shows that subarachacnoid spinal anesthesia is a real possibility in an outpatient surgery unit. Katkhouda [14] reported his experience with regional anaesthesia in 28 patients but using transabdominal laparoscopic surgery. The literature includes only one previous reference to the extraperitoneal technique under regional anaesthesia, in which Azurin et al. [15] compared 36 repairs with 16 done under general anaesthesia. They

Table 3
Cardiovascular, respiratory and anesthesic parameters during the surgery

Dermatomeric level	
10 min	T6 15 (50) T5 9 (30) T4 6 (20)
At the end	T6 9 (30) T5 7 (23.3) T4 14 (46.6)
Arterial pressure	
Before	149.5/78.7
5 min after punction	127.2/68.2
10 min after punction	127.2/66.3
15 min after punction	123.1/66.3
30 min after punction	126.4/65.9
At the end of surgery	126.6/66.5
Cardiac frequency	
Before	73.8
5 min after punction	81.5
10 min after punction	73.9
15 min after punction	72.2
30 min after punction	70.8
At the end of surgery	70.8
Pulsoximetry	100% (66.6); 99% (16.6); 98% (10); 97% (3.3); 96% (3.3)
Respiratory frequency	16 (14–20)
Reanimation unit stay	79.5 (60–135)

The arterial pressures are expressed in mmHg, the cardiac rates (frequency) are expressed in beats per min, the respiratory frequency in breathes per min, and the reanimation stay in minutes. Dates are expressed in media values, with percentages in brackets.

found no differences between the two groups. In a previous, study we demonstrated that none of the ten patients undergoing surgery with regional anaesthesia and presenting with pneumoperitoneum required conversion due to pain or technical problems. Conversion was always due to surgical problems and never involved any modification in the anaesthesia technique initially chosen. Regarding urinary retention we founded significant differences, unlike the results reported by Finley and Petros (19% retentions rate after general anaesthesia vs. 19% with regional anaesthesia) [16,17]. Like other authors we consider that to become familiar with the technique and perform it with relative security and easily experience of about 30–50 cases is required [2,3,5,18,19]. After such experience in our centre we are able to perform the technique on a standard basis under regional anaesthesia and in an outpatient unit. This has minimized hospital costs and made the extraperitoneal laparoscopic approach more competitive than conventional surgery, whilst matching the results of other centers which already have major experience with the classical techniques [3,11,16]. This study shows that from a surgical point of view there is no justification for choosing general rather than regional anaesthesia. However, only the anaesthesiologist after clinical evaluation of the patient should decide on the most appropriate technical option for treating inguinal hernias using extraperitoneal laparoscopy. In conclusion, general anaesthesia is not indispensable for performing the extraperitoneal laparoscopic technique in the treatment of inguinal hernias. Regional anaesthesia is equally safe and in our study allows earlier patient discharge.

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The economic benefits of ambulatory surgery relative to inpatient surgery for laparoscopic tubal ligation

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Abstract

This prospective economic study aims to evaluate the costs of both outpatient and inpatient laparoscopic tubal ligation (LTL) and compares this with the price proposed by the Institute for Informatics and Financial Health Management (Instituto de Gestão Informática e Financeira da Saúde (IGIFS)). The study included 24 patients, all candidates for a day surgery programme, assigned to two groups of 12 patients: GROUP A (ambulatory surgery (AS)) and GROUP I (inpatient). A highly significant statistical difference was found ($P < 0.01$) between the average surgery times for the two groups: GROUP A = 26.75 min, and GROUP I = 45.42 min. The study showed an average saving of 62.4% (€593.22) for each LTL performed on an outpatient basis compared with the inpatient regime. Extrapolating these results to all LTL procedures, the authors concluded that there would have been a saving of €107.372, 82 if the 181 LTP carried out in the Hospital Geral Santo António in 1999 had been performed under the ambulatory regime. The current economic evaluation highlights the urgent need to develop effective AS programmes in Portuguese public hospitals, especially at a time when National Health Service costs in Portugal are steadily rising.

Keywords: Ambulatory surgery; Laparoscopic tubal ligation; Costs

1. Introduction

The economic benefits linked to ambulatory surgery (AS) have unquestionably stimulated the incredible development it has witnessed since the 1970s in the United States and in many European countries, in the 1980s and '90s [1–4]. Indeed, even though the many important advantages implicit in AS are widely cited in the scientific literature [5–13], it is still the economic aspects that are attracting significant attention today, particularly as health costs are reaching dizzyingly high levels in many societies.

Most economic studies in this area point to lower hospital costs for AS, which range between 40 and 80% of the amount spent for the same operation under an inpatient regime [1–4]. These undeniable and consensual conclusions mostly came from North America in the 1980s, removing controversy from the issue to the extent that nowadays the topic is no longer studied.

Portugal has only recently woken up to ambulatory practice (in 1999 it accounted for only 5.5% of all operations [14]), and there are no reliable economic indicators to allow such a conclusion to be drawn as that noted in terms of the magnitude of the saving (although it would seem obvious that the North American results could be extrapolated to other countries, including that of Portugal). We have sought to assess the relative costs for the same operation (laparoscopic tubal ligation (LTL)) performed by the same surgical team, but under two different regimes: ambulatory (A) versus inpatient

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(I). We have also established the difference between the two models and compared the respective costs with the funding [15] proposed by the Institute for Informatics and Financial Health Management (Instituto de Gestão Informática e Financeira da Saúde (IGIFS)) for these operations.

2. Material and methods

This comparative analysis of the two alternatives and the respective cost assessment was carried out between 1 January and 19 April 2000. Approval was given by the Hospital Geral Santo António (HGSA) Ethics Committee, and the administrative bodies and technical management of the HGSA Departments involved, directly or indirectly, agreed to collaborate with the study.

Information was gathered in the HGSA, from the ambulatory surgery unit (ASU) for the outpatient operations and from the theatre room (TR) for the inpatient operations. The Office for Economic Studies in the HGSA was responsible for collecting the data, with the help of physicians and nursing staff.

The size of the sample for each group was based on 10% of the annual number of LTL procedures predicted for the year 2000 for the HGSA UCA, in a patient group completely free of any pathology (defined as ASA I by the American Society of Anaesthesiologists), aged between 25 and 45. This was calculated to be approximately 120 patients.

Twenty-four ASA I patients proposed for LTL were included. All were candidates for inclusion in an AS programme. They were divided into two groups of 12 patients according to the surgical regime under which they would be operated: GROUP A (AS) versus GROUP I (inpatient surgery). The surgical team was the same for the two groups. All the patients were given a balanced general anaesthetic by different anaesthetic teams.

Relative costs were determined by assessing surgery times, which were defined by the period measured from the time anesthesia started to the time when the theatre was ready to start the next case.

Only the direct costs related to the operation which the IGIFS used as the basis for its calculation of the diseases related groups (DRG) prices for AS (Table 1) were assessed. Costs related to pre-operative preparation (consultations, diagnostic tests, etc.) and to patient follow-up have not been included in our results since they do not form part of the DRG calculation. None of the indirect or intangible costs have been included as they are outside the scope of this study. The calculated values were compared with those established by the IGIFS for the above-mentioned DRG: DRG no. 362—Ligation of Fallopian tubes, via endoscopy, for the sums of €648.44 and 918.79, for ambulatory and inpatient surgery, respectively [15].

Table 1
Criteria laid down by the IGIFS to calculate the DRG value for AS

Cost of 'theatre room' and 'post-anesthetic recovery unit'
Cost of 'ward'
Cost of 'medical staff'
Cost of 'nursing ' and 'catering/accommodation'
Cost of 'administration' and 'ancillary staff'
Cost of 'clinical consumables'
Cost of 'CDTR' (complementary diagnosis and treatment resources)
Cost of 'medicines'

Anaesthetic and surgical techniques were performed in the same way in the two regimes. It should be noted that there is no scrub nurse for this type of procedure in the UCA, and so the nursing staff involved in the ambulatory regime only numbered two, while in the TR there were always three nurses in attendance.

With respect to the statistical analysis, a significance level of 0.05 was adopted. The Mann–Whitney test was used for comparison of the average surgery times.

3. Results

Table 2 gives the average surgery times recorded. The extremely significant difference found between the two values is stressed. The speed with which LTL was performed in the UCA in comparison with those carried out in the TR is striking, even though the same surgical team was responsible for both procedures in the two surgical environments.

None of the operations was attended by any major complication; all the GROUP A patients were discharged on the day of surgery, at around 7.00 p.m.; none of these patients had to be admitted or re-admitted within the 30 days following surgery.

Table 3 shows the costs of the operation for the two groups. Four kinds of direct costs are detailed (those incurred by undertaking the operations in question): staff; medicines; clinical consumables, and other materials (contracts, depreciation, other consumables, etc.). Note that there is an important difference in the staff costs (lower in GROUP A), thanks to the smaller number of nurses and quicker execution of the operation in this group. The biggest costs in terms of medicines in GROUP A was due to the use of more

Table 2
Average surgery time

	GROUP A	GROUP I	Mann–Whitney test
Average surgery time (min)	26.75 (20–34)	45.42 (35–65)	$P < 0.01$

Table 3
Cost of operations in the theatre (in euros per operation)

	GROUP A (€)	GROUP I (€)	Relative saving (I − A/I)
Staff costs	27.10	63.75	
Medicines	60.70	55.46	
Clinical consumables	28.90	31.74	
Other costs	39.00	59.09	
Total	155.70	210.04	25.9%

expensive analgesics (especially non-steroid anti-inflammatories, as opposed to the opioids, more used in GROUP I), but this is easily justified by the need for an effective multimodal analgesic plan, which has no side effects that could compromise discharge at the end of the day, as envisaged for these patients. The savings made exclusively at the level of surgical costs was 25.9%.

Table 4 gives the total costs (cost of surgery plus those incurred by hospital stay). The average hospital stay for GROUP I patients was 2.8 days. This figure was greatly influenced by a hospital stay of 7 days for one patient whose first booking for theatre time had to be postponed for 4 days because of lack of surgery time. The difference in costs of hospital stay thus registered a difference of €538.88; in other words, each operation in GROUP A represented an average saving of 72.7%. Attention is further drawn to the fact that the average daily value in 2000 of the HGSA Hospital Day Unit (phase II recovery area for day surgery patients, before discharge home) adopted for this study has been to some extent over-estimated. This multi-purpose unit treats, besides post-operative surgical patients, oncology patients that represent more than 50% of the total costs of this unit.

The final cost obtained makes it possible to calculate an average saving of €593.22 for each of the LTL operations in the sample in the HGSA UCA, which is an average saving of 62.4%.

Table 5 gives the financial outcome that the HGSA eventually obtained for the patients in this study. With respect to the surgical procedures included in this study, the HGSA *earned* an average of €290.62 per LTL performed under the ambulatory regime, and *spent* €32.25 for each LTL performed under the inpatient regime.

Table 5
Average financial outcome for operations carried out (LTL), for the HGSA (in euros)

	GROUP A (€)	GROUP I (€)
DRG funding (A)	648.44	918.79
Total average cost (B)	357.82	951.04
Difference (A) − (B)	290.62	−32.25

4. Discussion

The first point concerns the average operating times achieved. Indeed, it is often said that smaller units, like the HGSA's UCA, are more efficient and productive. This effect not only has indirect implications in the lower costs that accompany it: it could also play a crucial role in cutting down waiting lists for operations [5,6]. In a country that has earnestly debated this issue, the implementation of AS programmes could well be the obvious way to combat the causes of the problem through greater productive capacity in the National Health Service (NHS). This difference, which our study has helped to identify, will be the more relevant the greater the complexity and size of a TR in comparison with an AS programme in a Separate/Autonomous Unit, as is the case of the structures in question in the HGSA. This situation would probably be less relevant in situations where the AS programme functions in an Integrated Unit within a small scale hospital institution

Table 4
Total costs—theatre and hospital stay (in euros per operation)

	GROUP A (€)	GROUP I (€)	Relative saving (I − A/I)
Theatre costs	155.70	210.04	
Hospital stay (average—days)	202.12 (1.0)	741.00 (2.8)	
Total	357.82	951.04	62.4%

(TR with a maximum of three or four operating rooms, for instance).

Second, the fact that the surgical team in GROUP A did not include a scrub nurse (as is normal in most surgical teams) should be stressed. In fact, the lack of an scrub nurse in GROUP A, though open to discussion, follows several examples in other ASUs throughout the world. This situation cannot be repeated for certain surgical procedures (laparoscopic cholecystectomy, unilateral lobectomy of the thyroid, lumbar discectomy, among others). Furthermore, it lies in the context of scarcity of nursing staff and of an appreciable number of residents for the various surgical specialties, factors which have led the HGSA's UCA to adopt that structure for this type of operation.

Third, the difference in the costs of surgery does not seem to be too important when compared with the difference in costs for the hospital stay. It is true that the average hospital stay of 2.8 days for the GROUP I patients greatly influenced this (when the average in the price lists regulated by the IGIFS in Order no. 348-B/98 is only 2.1 days [15]). But it is equally true that in our institutions quite a few patients have their operations delayed through lack of surgery time, which results in high economic and other costs for the hospital, the patient, the NHS and the community in general. As mentioned earlier, the cost of the hospital stay ascribed to the GROUP A patients was overestimated owing to factors relative to the less than ideal organization in which the HGSA AS programme finds itself. Actually, the significance in terms of economic cost of the oncology patients who share the Day Hospital Unit facilities with the surgical patients is quite obvious, and cannot be underestimated. Bearing these two factors in mind, then, it is fair to consider that, if these factors were not involved, the difference in costs would probably remain the same, but their value would be lower, for the two groups.

Finally, in addition to the clearly greater efficiency and corresponding surgical productivity, not to mention the highly significant economic 'savings' (62.4%) that AS yields, we should further bear in mind that, by replacing inpatient operations with AS operations (a partial replacement of provision, depending on the type of surgery), the institution is enabled to use these facilities for other patients who need them, or it may even be possible, in the future, to close some surgical beds in our hospitals.

Extrapolating these findings to a large-scale AS programme in a general hospital like the HGSA, or to a national programme, would have a huge economic impact, and so this study should be considered carefully by everyone concerned with the management of national organizations linked to Health and Public Hospitals. As an example: if all the 181 LTL performed in the HGSA had been performed under an ambulatory regime, the HGSA would have saved €107,373.78. If the 1726 LTL carried out in Portugal in 1998 [16] had all been performed under the ambulatory regime, the national saving for this type of operation would have been €1,023,906.91. This situation is clearly utopian, as it is impossible to say that all these patients could have been operated on under an ambulatory regime. In the USA, in 1994, a mere 94.4% of patients underwent LTL operations under an ambulatory regime [16]! It should be remembered that only one type of procedure has been studied. Imagine the economic and social impact if this situation were extrapolated to other kinds of surgery. We believe that AS cannot today be supported virtually. It should be supported in an actual, pragmatic way, or else expressions such as 'economic rationality' and 'value-based care' (which Orkin [17] defines as being 'the best clinical outcome for a reasonable price') will cease to have any meaning for us.

5. Conclusions

In the HGSA, this study has led to the conclusion that an LTL carried out under an ambulatory regime costs 62.4% less in relation to the same operation when performed on an inpatient basis. In addition to other important advantages, such as those of a clinical and social nature (less incidence of hospital-acquired infections and post-operative complications; enhanced humanization, less disruption of the normal socio-family environment, and quicker resumption of socio-professional life), there seems to be no question as to the considerable economic benefits to be gained from developing AS programmes. These are greater technical efficiency (expressed in the utilization and combination of less expensive resources to achieve a desired outcome of the same or better quality), and greater economic efficiency, expressed in economic and social benefits for users, families and the community.

This study, which does not include similar approaches in the HGSA and in other hospitals, clearly shows the pressing need to develop effective, efficient AS programmes in the various hospitals in our NHS.

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Recovery after day surgery: a survey of anaesthetists regarding return of home fitness and street fitness

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Abstract

Anaesthetists from three hospitals were asked for their opinions on various aspects of day surgical care, particularly return to normal activities. There were marked differences in opinion, particularly with the role of the carer and the speed of return to the activities currently prohibited for 24 h. There was no consensus as to how often the patient should be checked upon by the carer. More than half of the anaesthetists chose to adhere to the current guidelines of avoiding driving for 24 h. Two-thirds of respondents were happy for their patients to return to work the day after surgery.

Keywords: Anaesthesia; Outpatient; Safety

1. Introduction

Modern day case surgery has a history of safety, with minimal increase in major morbidity or mortality in the peri-operative period [1]. This has been, in part, due to the enormous efforts spent by the providers of day surgery services in patient education. Integral in this education process are instructions on avoiding potentially dangerous activities. Ogg first highlighted the potential for harm in 1972 [2]. In this landmark paper, he discovered that out of a 100-patient cohort, 31% traveled home without a responsible escort; 9% of car-owners drove themselves home, 39% had driven within 12 h and 73% within 24 h of their operation. In addition, 6% of patients consumed alcohol within the first 24 h. In the intervening 30 years, the process of patient education and compliance has improved, as recently demonstrated [3,4]. The instructions we give to our patients have remained largely unchanged despite dramatic improvements in anaesthetic agents and techniques available for patients undergoing day surgery. As providers of day surgery, we must consider the implications of all the prohibitions we detail to our patients. This study uses a questionnaire to assess the attitudes of anaesthetists from three British hospitals with regards to the day surgery process.

The three centres were chosen in an attempt to produce data representative of British anaesthetists. The Addenbrooke's Day Surgery Unit (Cambridge) is a pioneering, long-established day surgery unit affiliated to a university teaching hospital. The unit at Stoke-on-Trent is in a large urban district general hospital. The unit at King's Lynn represents a medium large rural district general hospital.

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2. Method

Questionnaires (Appendix A) were sent to all anaesthetists working at Cambridge, Stoke-on-Trent and King's Lynn. The return of these questionnaires was entirely voluntary. As the process was entirely anonymous, no attempt could be made to follow-up non-responders.

The results from the returned questionnaires were analysed using the SPSS 9.0 statistical package.

3. Results

A total of 168 questionnaires were sent to all the anaesthetists at three hospitals—70 to Cambridge, 70 to Stoke-on-Trent and 28 to King's Lynn. There were 70 returns in total (41.67%) 30 from Cambridge, 26 from Stoke-on-Trent and 14 from King's Lynn.

Of the respondents, 43 (61.4%) were consultants, nine (12.9%) senior specialist registrars, seven (10%) junior specialist registrars, five (7.1%) senior house officers and six (8.6%) non-consultant career grade anaesthetists.

Of the 49 non-trainees surveyed, 39 had regular lists with patients presenting for day surgery. The cohort included 24 anaesthetists (including five trainees) with a special in day surgery. Seventeen anaesthetists had attended day surgery conferences in the past.

With regards to pre-emptive analgesia, 49 anaesthetists (70%) believed it to be a concept that is applicable to clinical practice. The proportion was similar (70.6%) in those anaesthetists that had attended day surgery conferences. All but three of the anaesthetists that believed in this concept routinely administered non-steroidal anti-inflammatory drugs (NSAIDs) or performed nerve blocks prior to incision.

Rectal NSAIDs were used routinely by 42 anaesthetists, oral NSAIDs were used by 40 anaesthetists, and nerve blockade was practiced by 54 anaesthetists.

There was marked disagreement amongst the anaesthetists with regards to the duration of time that a patient should be kept in the day surgery unit after completion of surgery (Table 1). Twenty out of the 62 who responded felt that there should be no minimum time. 26 anaesthetists favoured 2 h or less. Out of the 17 anaesthetists who had attended day surgery conferences, 11 favored 2 h or less. Only four anaesthetists supported the fast track theory of no minimum time, whilst one favored 2.5 h. One anaesthetist failed to respond to this question.

Table 1
Minimum duration of stay (hours) after operation

Time (h)	Number of anaesthetists
No minimum	20
1	12
2	14
3	6
4	9
6	1
Left blank	8

Table 2
Minimum and maximum ages for carers

Minimum age (years)		Maximum Age (years)	
Age	Number of anaesthetists	Age	Number of anaesthetists
16	10	60–65	8
18	35	70–75	6
20–21	5	80	3
25	1	No maximum	33
Adult	9	Adult	9
Fit	1	Fit	3
Left Blank	9	Left Blank	8

Table 2 shows the distribution of responses for the minimum and maximum age limits with regards to the carer. A majority felt that the minimum age should be 18 years and that there should be no maximum age.

There was more agreement as to the location of the designated carer. Sixty-four (91.4%) anaesthetists would be happy for the carer to be within the same house. Only two felt they should be in the same room. Surprisingly, one anaesthetist was happy with a carer that was readily available by telephone! Three anaesthetists left this question unanswered.

The least agreement was with the frequency that patients should be checked upon. Twenty-four respondents (34.2%) failed to answer this question! The responses ranged from 'no need to check' (three anaesthetists) to check every 15 min! There was some reference made to variations taking into account the health of the patient and the type of surgery performed. Some mentioned a lack of necessity in checking the patients overnight.

The recovery time thought to be necessary to allow the patient to drive, drink alcohol, make decisions, look after children, cook, venture outdoors, take sedatives and be safely left alone are shown in Table 3.

With regards to returning to work, 25 (35.7%) felt the patients should not return to work the day following day surgery. Nine (12.9%) anaesthetists were happy for the patients to return to work as long as their operations were done the previous morning. Twenty-four (35.7%) of the anaesthetists would be happy for their patients to work the following day, regardless of the time of the

Table 3
Number of anaesthetists indicating the time required for adequate recovery to participate in the various activities

	Drive	Drink alcohol	Make decisions	Care for children	Cook	Go out	Take sedatives	Be alone
Immediately	0	1	2	1	0	0	0	0
Later same day	0	10	6	6	6	2	5	1
Next morning	14	17	16	17	17	20	14	32
After 24 h	44	33	35	34	38	39	36	27
After 48 h	11	8	9	10	8	6	13	8
Left blank	1	1	2	2	1	3	2	2

operation. Eight (11.4%) said the fitness to work depended on the jobs involved. Pilots and bus drivers were some of the occupations mentioned that were felt to need a longer recovery. One anaesthetist felt that anaesthetists could not safely return to work within 24 h. Three anaesthetists left this question unanswered.

One of the anaesthetists from Cambridge declined to complete the questionnaire beyond stating his grade (consultant) and the fact he did not regularly anaesthetise day cases.

4. Discussion

It is clear that there is very little agreement between anaesthetists as to the length of time required for recovery from day surgery under general anesthesia. Certainly many anaesthetists indicate that the type and duration of surgery, combined with an individual patient's pre-morbid condition has an influence on the recovery time. This is in keeping with current thinking on 'fast-track' recovery, which suggests that over adherence to rigid recovery protocols is the major factor preventing the earlier discharge of day case patients. Some anaesthetists would argue that the use of ultra-short acting anaesthetic agents could permit recovery within hours of surgery, so waiting the full 24 h is unnecessary.

Some information can be obtained from clinical studies comparing the effects of alcohol and anaesthetic agents on the results of psychometric tests. We should be able to extrapolate from the time taken for anaesthetic agents to produce less effects on psychometric testing as compared with the legal driving limit for alcohol, to guide us in advising a safe time for the resumption of driving [5,6]. Obviously, this will not take into account disability or cognitive defects arising from the use of opioid analgesia and post-operative pain. These studies also employed fit, young subjects who were anaesthetized for limited periods of time. The sample size of each group was also small. It would, therefore, be unrealistic to directly translate such results into modified instructions after day surgery.

The Driver and Vehicle Licensing Authority (DVLA) of Britain has produced guidelines for fitness to drive with regards to various medical conditions [7]. With regards to driving after surgery, there is no need to notify the DVLA unless the medical condition was likely to affect safe driving for longer than 3 months. Patients should discuss the time of safe return to driving with their doctors. The DVLA advises such decisions be based upon recovery from anaesthetics (sedation and cognitive impairment), the distracting effect of pain, impairment due to analgesia (sedation and cognitive impairment) as well as any physical restrictions due to the surgery. The driver is ultimately responsible and must be able to demonstrate fitness to drive if challenged by the law. They suggested that drivers confirmed cover with their insurance companies prior to taking the wheel. There was no advice regarding the period of avoidance of driving for patients undergoing minor procedures lasting a few minutes with minimal post-operative pain.

Despite the advice against making important personal or business decisions for the first 24 h post-operatively, 64.3% of anaesthetists are happy for their patients to return to work the following day. Some add provisos to this, particularly in terms of type of job. Patients whose jobs involve the transportation of the public were thought to be most at risk of endangering themselves and others, so should stay home. One respondent felt that it would be dangerous for anaesthetists to return to work the following day. This exclusion may be questionable as the regular inhalation of varying amounts of volatile anaesthetic agent is, after all, an occupational hazard.

Controversy is greatest in terms of the role of the carer. As pointed out by Smith [8], problems encountered overnight may be noticed by a carer in the same room, but are most likely to be missed by a carer elsewhere in the same house. To expect the carer to be awake in the same room for 24 h is unrealistic. Even though the consensus is that there should be someone in the same house, no one really knows how often the patient should be checked for problems, particularly when both patient and carer are asleep. The high rate of non-response to the question about frequency of check-

ing on the patients (34.2%) probably reflects a lack of confidence about what might constitute a sensible suggestion.

The age range of carers is also an unresolved problem. Most agree that only responsible, fit adults should undertake the role, but there is no consensus as to when adulthood actually begins. Certainly some teenagers are more responsible than many young adults are. With the increase in older patients having day surgical procedures, there will also be an increase in the age of their carers. Do we then have to assess the fitness of the carers as well as that of the patients presenting for day surgery?

Of interest as well is the consultant anaesthetist who refused to complete the questionnaire beyond stating his grade and lack of interest in day surgery. It is likely that the non-responders are also in this category but did not even return the form. Considering that a major proportion of surgical work occurs on an ambulatory basis, certainly all anaesthetists are likely to encounter day cases even within in-patient lists, or outside their National Health Service practice. This lack of interest purely because they do not routinely anaesthetize day cases in a dedicated setting makes rapid discharge after inpatient surgery potentially flawed.

Although our data were collected from anaesthetists of all grades from three different hospitals, the information derived may not be truly representative in view of the poor return rate. There could be several reasons for this. There is certainly an overwhelming amount of data collection going on within the anaesthetic community, and little time given to administration during 'office hours'. Such surveys are often low priority and, therefore, not given the required attention. The questionnaires were sent out in the month of August, traditionally the month for holidays. Finally, the questionnaire asks some probing questions about the management of day surgery patients that many providers of day surgery would find difficult to answer. This could have deterred anaesthetists who have little interest in the subject from responding.

Adequate pain control is vital for successful discharge after day surgery. Although studies have examined the possibility of improving this by the use of pre-emptive analgesia, there is little evidence that this concept successfully reduces the post-operative analgesic requirements. We sought to identify if our cohort of anaesthetists appreciated the flaws associated with this theory. Most of the respondents seemed to be unaware that there is little substantive evidence for pre-emptive analgesia in clinical practice. There is often confusion about the meaning of the term pre-emptive analgesia. Strictly speaking, this describes the administration of analgesia (nerve blocks or oral analgesia) before the start of surgery and is associated with less analgesia requirements in the post-operative period [9]. This is thought to be due to prevention of activation of pain pathways and may be difficult if not impossible to achieve. Some anaesthetists interpret the term more loosely and mean simply putting the block in at the beginning rather than at the end of surgery. Our results may be difficult to interpret as we did not define the term in our questionnaire. The confusion about the definition of pre-emptive analgesia may result in an increase in the use of multi-modal analgesia prior to surgery. This should reduce the need for intra-operative and post-operative opioids, resulting in improved post-operative analgesia with less opioid-induced emetic symptoms.

In conclusion, there is little agreement amongst anaesthetists as to how quickly patients should be allowed to resume normal daily activities after day surgery under general anaesthesia. Despite the widespread use of short acting anaesthetic agents in day surgery, we continue to give our patients the same advice that was disseminated in the early days of day surgery. Research into the degree of psychomotor impairment after anaesthesia gives some indication that we may be able to speed up the recovery process. It appears that for now at least, the guidelines are unlikely to be reduced to under 24 h as patient safety remains our main priority.

Economic pressures mean that day surgery increasingly encompasses not only the fit patient having minor surgery but also more intermediate procedures in less fit patients. There is likely to be wide variation in the recovery rate after day surgery under general anesthesia. Whilst we are able to advise that day surgery patients are accompanied home and overnight post-operatively, a single set of guidelines giving advice about post-operative activity (particularly driving) is probably not very sensible. It may be wiser, especially given the current interest in patient information and consent, to be more open about our lack of knowledge in the field of psychomotor recovery from general anesthesia and leave the responsibility very firmly with the patient to resume normal daily activities when they feel able to do so. Many over the counter medicines bear labels with the wording '*Warning: may cause drowsiness. If affected, avoid driving and operating machinery*'. Perhaps we should simply send patients home with the same advice.

Acknowledgements

We wish to thank the anaesthetists who took the trouble to fill in and return the questionnaires.

Appendix A

Grade of anaesthetist: _____

Do you regularly anaesthetise day cases? Yes / No

Have you a particular interest in day surgery? Yes / No

Have you ever attended a day surgery conference? Yes / No [No: _____]

Do you believe in the concept of pre-emptive analgesia? Yes / No

Do you employ the following pre-incision:

PR Voltarol / Oral NSAIDS / Nerve blocks

Is there a minimum time you feel patients need to be observed before discharge?

No / Yes (_____ hours)

How do you interpret the role of the carer?

Age range? _____

In the same room / In same house / Within 5 minutes of phone call / Unnecessary

How often should the patient be checked? _____

Assuming a procedure under general anaesthesia lasting under 1 h was performed, and no surgical restrictions are present, what is the earliest time would you be happy for the following to occur?

	Immediately	Later same day	Next day (<24 hours)	After 24 hours	After 48 hours
Drive					
Drink alcohol					
Make decisions					
Care for children					
Cook / Iron					
Go out alone					
Take sedatives					
No longer need carer					

Would you be happy for a patient to go back to work the next day?
No/Only if op was in the morning/Yes, as long as feeling well.

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Variation in day surgery among Dutch hospitals: The development of a theoretical model to explain variations

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Abstract

The aim of this paper is providing a first step in explaining variations in day surgery rates among Dutch hospitals. A theoretical model was set up to explain variations based on diffusion theory and environmental characteristics. We tried to test our model by means of routinely collected data from administrative databases. The S-shaped curve of diffusion could be shown combining data on laparoscopic cholecystectomies (early phase of adoption), cataract surgery (middle phase) and curettage and dilatation (late phase of adoption). The theoretical model was translated into a regression model for the latter two procedures. The routinely collected data appeared not adequate to test our hypotheses. The data were available only at hospital level. Probably more detailed data on physician partnerships and hospital circumstances are needed to adequately test our hypotheses.

Keywords: Day surgery; Variation; Diffusion

1. Introduction

Ambulatory surgery in its present form started in the United States of America in the early 1960s [1]. Ambulatory surgery (also called day surgery) is clinical admission for a surgical procedure, with discharge of the patient on the same working day. Especially in the last decade the number of admissions for day surgery has increased greatly. This increase was facilitated by innovations in surgical and anaesthetic techniques. The implementation of new surgical procedures, for example minimal invasive surgery, and new short-acting anaesthetics with minimal cardiovascular side effects made early discharge possible. However, there is quite some variation in the use of day surgery, at least among countries [2].

Day surgery can be seen as a new technology, and therefore, the theory of diffusion of knowledge and technologies may be applied to this field. Beside acceptance of new technologies, variation may stem from the environment in which day surgery takes place, for instance the hospital's day surgery facilities, the number of beds for in-patient admission, waiting lists for surgical treatments and financial arrangements. We can reasonably expect that insurers will try to promote more cost-effective procedures. Cost-effective means an intervention that gives good benefit in relation to costs compared with other procedures. Besides this, the use of these techniques may have been stimulated by in-patient bed reductions [3].

The diffusion of technologies, together with the environmental characteristics, takes a central place in this paper. Some hospitals or specialists adopt new technologies necessary for day surgery earlier than others. The central questions of this paper are:

1) What is the extent of variation in day surgery in the Netherlands?
2) To what extent can this variation be explained from environmental circumstances and diffusion processes by analyzing data from an existing data-set?

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1.1. Diffusion

Diffusion can be defined as the process by which an innovation is communicated through certain channels over time among the members of a social system [4]. The development of medical innovations does not mean that innovations actually will be put into use. Many innovations require a lengthy period, often of some years, from the time they become available to the time when they are widely adopted [4]. Prior to the adoption of an innovation, hospitals and physicians will have to be acquainted with the innovation, and further more, they have to be convinced of the advantages and disadvantages of it. Following acquaintance with the innovation, the decision will be made whether to adopt or reject the innovation. Not every hospital or physician wants to adopt new treatment methods from the instant they are invented.

Adopters can be divided in primary adopters and secondary adopters. Primary adopters are those persons that actually have to use the interventions. In this case these are the medical specialists. Secondary adopters are those who facilitate or restrict the primary adopter's behavior. In this case these are the hospital management and patients. Patients can only be treated by day surgery when they give their consent for this type of treatment. On the side of the hospital and its management day surgery is restricted or facilitated by the hospital's willingness to invest in the necessary infrastructure.

Both primary and secondary adopters are assumed to behave rationally and be goal oriented. Their behavior is aimed at utility maximization given their preferences and constraints (according to rational choice theory, elaborated by Coleman [5] and Lindenberg [6]). The assumption of goal oriented behavior is important in explaining socially patterned phenomena, because it enables us to account for reasoned changes in behavior. We assume that the main assignment of both physician and hospital is to improve patients' health. However, in choice situations with equivalent or uncertain outcomes, there is room for considerations other than medical interest.

We suppose that medical specialists aim at improving their patients' health, keep an eye on their own financial interests and workload, and try to gain prestige with their colleagues. For patients we assume that they want their health problem solved, their anxiety reduced, and to keep an eye at their broader social and financial well-being. Hospitals, personified by their management, are supposed to strive to survive as an organization by keeping the organization financially healthy and being attractive to patients and personnel [8].

Rogers [4] distinguishes three types of adopters in three different stages. The first adopters are called the innovators. When the diffusion progresses, the early majority adopts the new technology. Finally, in the last stage, the last group will accept the new technology. This group is called the laggards. The question now is how the adoption of day surgery contributes to the goal attainment by each of these groups of actors. It could be argued that the early adoption of day surgery (by the innovators) depends on the variation between the individual ambition of medical specialists to innovate, which may contribute to variation among primary adopters. However, without institutional support from the hospital, innovations like day surgery will not survive, especially when institutional investments (like special waiting rooms, wards or operatis theatres) are needed. Adoption of day surgery at this stage will acquire the character of strategic choices by medical specialists and hospital management. Strategic choices, by adopting new technologies, are pro-active, look at long term survival and less at short term gain. It is expected that in the early phases of diffusion, immaterial influences will be more important than in the later phases. The adoption of day surgery in the later phases (early majority and laggards) of the diffusion process is probably more driven by regulative forces (such as reimbursement rules of third party payers), normative forces (if many people in many other places can be treated in day surgery, this becomes the normal expectation), and mimetic forces (specialists and hospitals doing what most others do) [7,9]. The implication might be that in the later phases of diffusion of day surgery material influences such as funding, payment and insurance are more important.

1.2. Hypotheses

Table 1 specifies a number of structural conditions and hypotheses about the relative attractiveness of day surgery compared with in-patient treatment.

The attractiveness of day surgery depends on conditions at the health system level (payment, funding and insurance systems) and differs for hospital, specialist and patient. For each phase of the adoption process, the different conditions may differ in importance.

2. Data and methods

2.1. Data

This study is based on two data-sets.

The first data-set contains national rates of day surgery of the years 1992–1999 for different procedures. With these data we illustrate the diffusion of admissions for day surgery in the course of time. We choose three interventions, that are in different phases of the diffusion process. The percentage of day surgery in which the intervention has been carried out determined the categorizing in the different stages of diffusion. These

Table 1
Adopters of day surgery in relation with conditions and goals

Adopters of day surgery	Goals	Structural conditions	Attractiveness of day surgery is higher if	Operationalization[b]
Specialists	Health of patients	Employment situation/ payment system	Day surgery is better remunerated	–
	Income/workload	Number of colleagues	Day surgery is associated with lower workload	–
	Prestige		The number of specialists in the group is larger	–
			Age of specialist is lower	–
Hospitals	Financially healthy	Funding and budgeting system	Budget available for innovations/new technologies	Hospital size (beds)
	Attractive to patients	Market situations	Hospitals are funded by global budgets or DRGs[a]	–
	Attractive to personnel	Availability of clinical and day surgery facilities	Demand pressure on hospital beds	65+ in market area
			The number of clinical beds is smaller and/or has decreased more in the preceding years	Beds per 1000 inhabitants in market area and decrease in beds in 5 years
			Special day surgery wards are available	–
			More competing hospitals are active in the area	Number of hospitals in market area
Patients	Health	Age, probability of complications	Patients are in good physical condition	–
	Costs	Insurance status	Their insurance coverage for hospital days is worse (e.g. bed day co-payments)	–
	Burden on social network	Availability of (in)formal cares	Patients are covered by formal home care	Number of GP's per 1000 inhabitants in market area
			Patients are covered by informal home care	–

[a] Compared with per diem payment.
[b] –, No operationalization possible with the available data.

interventions are: cholecystectomy (adopted only by innovators), cataract surgery (adopted by the early majority) and curettage and dilatation of the uterus (almost all have adopted the intervention, besides laggards).

The second data-set is a cross-section of all Dutch hospitals in the year 1995. From each hospital data were available the number of places for in-patient admission, the number and the rates of day surgery for a number of interventions, the degree of urbanization of the hospital market area, the number of hospitals in the same area, the percentage of senior citizens (65 years and older) and the number of general practioners (GPs) per 1000 inhabitants in the health area around the hospital.

Both data-sets contain data that are routinely collected in the Nationwide Medical Registration Program (Landelijke Medische Registratie (LMR)) by Prismant [10].

2.2. Illustrating a diffusion curve

Diffusion of innovations is a dynamic process and we tried to capture some of the dynamics of the process by comparing different interventions that are in a different phase of the diffusion process. Assuming that the diffusion of day surgery as an innovation in medical care shows the characteristic pattern of many innovations, one might expect that the adoption of different procedures in day surgery show the same cumulative pattern: the S-curve or logistic curve. Therefore, a S-curve was fitted through the consequent phases of the three procedures, based on the data of all three procedures together.

2.3. Operationalizing the hypotheses

For each actor, the hypotheses were operationalized, if possible, using the routinely available data. We were not able to test the hypotheses concerning the specialists conditions, since we either did not have suitable data (number of specialists in partnership per hospital, attitudes towards workload of day surgery compared with in-patient care) or the data did not vary within our research area (remuneration of day surgery).

From the hospital data, we used the size of hospitals in terms of the number of beds as a proxy for the benefit of applying new technologies. Larger hospitals are assumed to have larger budgets available for technological investments. Besides, larger hospitals see more patients and may benefit of economies of scale. Demand

pressure on a hospital is represented by the number of in-patient beds per 1000 inhabitants and by the proportion of elderly (65 years or older) in the hospital market area. The idea is that elderly have a larger chance of (complicated) health problems and thus give a larger demand pressure on in-patient beds. A high proportion of elderly will, therefore, lead to higher day surgery rates, because younger, relatively healthier patients will be treated in day surgery in order to free in-patient capacity for the elderly. Another source of pressure on available beds within a hospital, is bed reduction, expressed in the proportional bed reduction per hospital within a period of 5 years (1990–1995). No data were available about the existence of special wards for day surgery in 1995. The competition among hospitals is expressed by the number of hospitals in the hospital market area.

The patient variables were operatonalized as follows. In the Netherlands, there is no co-payment for day surgery nor for in-patient care, so the hypothesis concerning the insurance coverage could not be tested. The degree in which patients are covered by after care was estimated by the number of GPs per 1000 inhabitants.

2.4. Regression model

Summarising, we draw up the following regression equation:

Rate of day surgery =	*f*(hospital size, beds, GP's, elderly, competition)
where, hospital size =	number of in-patient beds in the hospital
beds =	number of beds per 1000 inhabitants in the hospital market area
bed reduction =	this is a dummy variable. The value 1 indicates a bed reduction in the period 1990–1995 per hospital, the value 0 indicates no reduction
Gps =	number of GP's per 1000 inhabitants
elderly =	percentage elderly people (65+) in a health area[1]
Competition =	number of hospitals in a health area[2].

Two regression models were set up. One for cataract surgery and one for curettage and dilatations of the uterus. For cholecystectomy the percentage of interventions carried out in day surgery was too small to obtain reliable results. We assume that for cataract surgery the effects of the independent variables will be different from those for curettage and dilatation of the uterus. Cataract surgery was in 1995 less commonly carried out in day surgery compared with curettage and dilatation of the uterus. Therefore, surgeons that perform cataract surgery in day surgery, and hospitals that provide the facilities, can be classified as early majority in terms of Rogers diffusion theory. The surgeons or hospitals that still do not carry out curettage and dilatations of the uterus in day surgery may be characterized as laggards in this case.

3. Results

In Fig. 1 we show that the distinctive interventions indeed can be projected on a S-shaped curve.

Laparoscopic cholecystectomy belongs to the group of interventions which are seldom undertaken in a day setting in The Netherlands at present, and thus represents a technique in the phase of adaptation by innovators. An increase is expected since in the USA ambulatory laparoscopic cholecystectomy showed a strong expansion. Lau and Brooks [11] showed an increase from 0.6% in 1993 to 48% in 1997 in a major teaching hospital. Also in Canada, laparoscopic cholecystectomy rates increased strongly in 1 year by about 18%, resulting in a 35.6% rate in 1997–1998 [12]. In the Netherlands in 1992 the percentage was 0% and in 2000 the percentage was just below 2%. The second intervention, cataract surgery, was in 1995 adopted by early adopters. It is placed in the middle section of the S-curve in Fig. 1. Curettage and dilatation of the uterus can be categorized in the phase of adoption by laggards since the majority of these interventions are executed in day surgery. The results show that there is variation among interventions in the degree in which they are carried out in day surgery.

To investigate the influence of circumstantial characteristics on day surgery rates and whether the influence of these characteristics differs by phase of

[1] A health area is an administrative region based on the hospital planning act (WZV-regio).

[2] A health area is an administrative region based on the hospital planning act (WZV-regio).

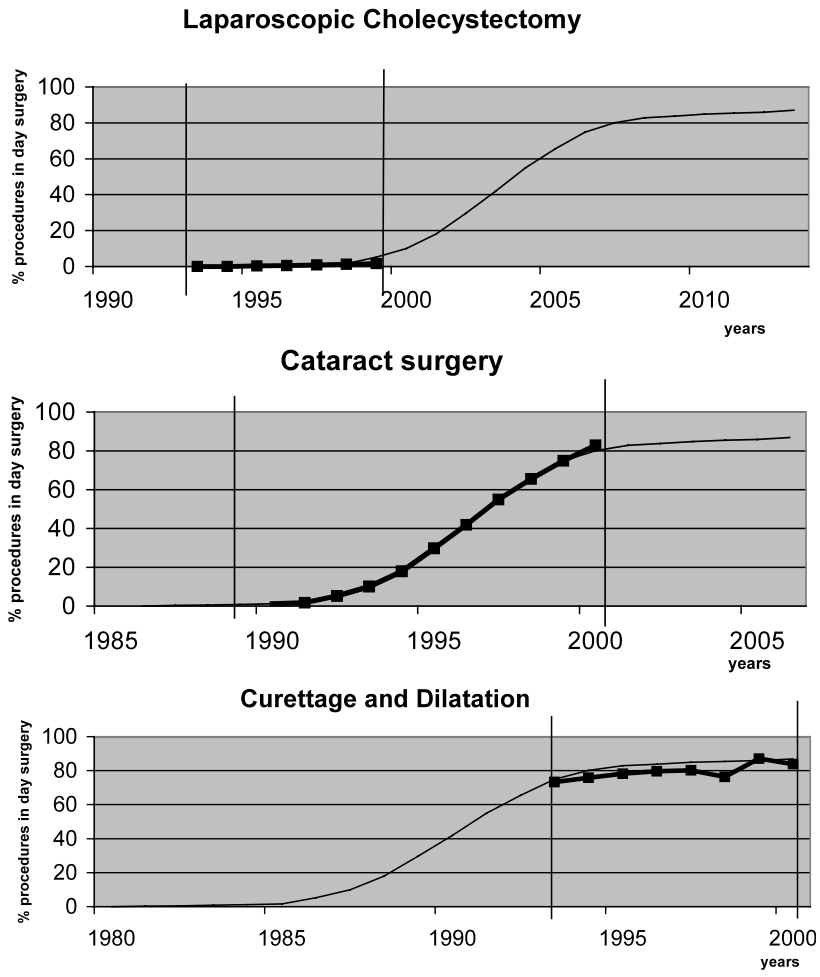

Fig. 1. The diffusion of day surgery in The Netherlands for selected procedures.

Table 2
Regression analyses to explain variation in day surgery ($n = 106$)

Dependent variables	Independent variables	B-coefficients	t-values	Significance
Rate of day surgery for cataract surgery	Hospital size	0.02	1.39	0.17
	Beds	1.33	0.26	0.78
	GPs	99.97	0.75	0.46
	Elderly	86.56	0.41	0.68
	Competition	−2.03	−1.71	0.09
	Bed reduction	−12.58	−1.83	0.07
	Constant	−19.77	−0.29	0.77
	Adjusted R^2	0.02	–	–
Rate of day surgery for curettage and dilatation	Hospital size	−0.01	−1.35	0.18
	Beds	0.18	0.09	0.93
	GPs	−29.56	−0.54	0.59
	Elderly	−9.50	−0.11	0.91
	Competition	0.34	−0.69	0.49
	Bed reduction	0.815	0.29	0.77
	Constant	92.86	3.33	0.00
	Adjusted R^2	0.00	–	–

diffusion, we carried out regression analyses. The results of the regression equations are shown in Table 2.

The results show that none of the expected relationships could be demonstrated. None of the estimates are significant ($P < 0.05$).

4. Conclusion and discussion

In this study we focussed on the diffusion of day surgery and the conditions that influence this diffusion. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system [4]. We argued that the adoption of day surgery in the early phases of diffusion acquires the character of strategic choices by medical specialists and hospital management. In the last phases material influences such as funding, payment and insurance type may become more important in adopting the new procedures.

Our first research question concerned the extent of variation in day surgery in the Netherlands. We conclude that the total variation of day surgery differs among different interventions. Through the rates of day surgery for laparoscopic cholecystectomy, cataract surgery and curettage and dilatation of the uterus during the years 1992 till 1999, an illustrative S-curve can be drawn. Physicians that provide laparoscopic cholecystectomy in a day surgery setting can be classified as innovators. The executers of cataract surgery in day surgery admission can be classified as early adopters. The surgeons who did not execute curettage and dilatation of the uterus in day surgery admission in the year 1995 may be characterized as laggards. For curettage and dilatations of the uterus the upper limit of what is medically possible in day surgery could well be reached. The medically based upper limit might differ according to the procedure studied and could for instance be lower for cholecystectomy.

Besides variation among interventions, there is variation among hospitals in the rate of day surgery within one intervention. To explain this variation (second research question) a set of hypotheses was set up about the role of different actors in the adoption of day surgery (see Table 1).The findings, however, do not confirm our theory. We think this is due to the abstract level of the variables we used to operationalize our hypotheses. We have tried to make use of readily available, nation wide routinely collected data. Since these secondary data were collected for other purposes than our research, this brings unavoidable second best choices of variables. For a test of the hypotheses, more specific data, especially data on physician and patient characteristics are necessary.

Probably, the variation in day surgery can be explained by variables on the level of the specialist working in the hospital and on the patient level. Earlier in this paper we motivated the role of the specialist in the choice for carrying out day surgery, like age of the physician (young physicians tend to adopt innovations earlier than older physicians) and number of specialists in the specialist partnership. Furthermore, patients' characteristics, such as age, possibilities for home care, insurance and preference for day surgery or hospital admission can have an influence on the rate of day surgery. But for none of these characteristics we have data.

This study has taken a step in the direction of studying the variation in day surgery by defining the relationship between day surgery and hospital size, number of beds, bed reduction and number of GP's per 1000 inhabitants in the hospital market area, percentage of elderly and the number of hospitals in the hospital market area. It is possible of course that other variables explain more of the extent of the variation.

It is worth while to look at how you can use routinely collected data for answering new research questions. You can save time and money by using existing data instead of collecting new data. Moreover you experience what sort of data are important for answering you research questions. In spite of the limitations our theoretical model gives more insight in how variation in day surgery can be explained. The approach outlined in this study should be replicated on the basis of primary data on the level of the patient and the specialists. Additionally it can be an argument to study the interaction between variables on different levels.

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Testing the effectiveness of a nursing intervention in relieving pain following day surgery

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Abstract

The purpose was to determine if a nursing intervention pre-operatively with post-operative follow up would improve levels of pain, and the extent of common symptoms such as nausea and constipation. Two hundred and twenty-two surgical day patients undergoing arthroscopic knee surgery, mammary reduction, hernia repair and anal surgery completed pain diaries post-operatively. Nurses telephoned the intervention group on post-operative days 1, 2 and 3 with advice and support. Results indicate that the telephone intervention decreased patients post-operative pain. Patients do not always understand oral or written information given at discharge and there is a need for specific follow-up advice and information.

Keywords: Pain management; Ambulatory surgery; Nursing intervention; Patient teaching; Brief pain inventory; Pain diary

1. Introduction

The number of procedures performed in ambulatory settings is increasing as a result of technological advances, economic necessity, and the desirability of avoiding hospital stays. Despite the success of these procedures and the many benefits of this setting, there are indications that patients often experience problems following discharge that require self-management skills as well as advice and follow-up care. The potential problems identified include: pain, nausea, vomiting and sleeplessness. Of these problems, pain is reported to be the most significant issue and is reported to be the major reason that most patients contact their general practitioners after surgery [1–3]. Several studies have indicated that patients need information prior to ambulatory surgery [4,5] and decreased physical and psychological trauma has been linked to pre-operative patient education [5]. One limitation of day surgery is that nurses have restricted time for pre- and post-operative teaching about pain management and other aspects of care.

Information sessions prior to the day of surgery, such as at the time of booking or in pre-assessment clinics, tend to be preferred by patients [6] and reduce pre-operative concerns [7], but all patients do not have these opportunities. Information that is given in the immediate pre-operative and/or post-operative time periods may not be remembered [8,9], because of anxiety prior to surgery and because recovery from anesthesia combined with analgesic medications may affect the patient's ability to absorb and remember information. Patients have varying requirements for pre-operative information, as some prefer substantial information and others very little or none [8]. Researchers have identified that although generally pre- and post-operative teaching is effective some patients want more professional advice and information than they received [10,11]. Dissatisfaction with the level of information and amount of information received has been linked to experiencing more post-operative symptoms, [11] particularly pain [12,13]. Oberle [13] found that patients need and want personalized information following day surgery.

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As there are practical and economic limitations to providing patient teaching in the immediate pre- and post-operative situations in ambulatory surgery, some authors have explored providing information via post-operative telephone calls [8,10]. These calls can address patients' concerns and provide personalized support when the stress of pending surgery is over and their concerns are more apparent. Studies about the effects of patient teaching following day surgery are limited. One example [14] reported that patients want specific details about practical management of their everyday life following surgery and with shortened hospital stays this information is not readily available.

Telephone follow-up after day surgery is both an economical means of providing teaching and support that cannot be provided during the limited in-patient stays and a method of gathering data. Mitchel's [15] extensive literature review of adult patients' perceptions of day surgery lists several examples of telephone follow-up studies. These included determining patient's perceptions of day surgery, identifying common post-operative complications, and determining when patients felt able to resume normal activities [5,16–23].

1.1. Purpose and questions

The purpose of this study was to determine if a pre-operative intervention with post-operative follow-up would improve patients' pain management following discharge from day surgery. The patient intervention focused on advice about pain management and on managing the side effects of pain-relieving medications. The following research questions were addressed:

1) Do patients who receive an educational intervention experience lower levels of pain than those patients who do not receive an educational intervention?
2) Is there a difference between the two groups (those who receive an educational intervention and those who do not) with respect to the presence of symptoms experienced after discharge?
3) Does the rate of pain reduction over time differ between the two groups?
4) Does the level of impact of the symptoms vary between the two groups?
5) Does the incidence and level of impact of symptoms vary over time between the two groups?
6) Does the amount of medication consumed differ between the two groups?
7) Does the amount of medication consumed over time differ between the two groups?
8) What are the effects of patient characteristics (age, gender, ethnicity, education, level of anxiety, type of surgery) on their pain, symptoms and medications consumed?

2. Patients and methods

2.1. Population

All patients over a 5 month period, undergoing selected surgical procedures were approached, in a day surgery unit of a large urban hospital and invited to take part in the study. There were four major surgical groups: anal surgery, hernia repair, arthroscopic surgery, and, in the last 5 weeks of the study, mammary reduction and enhancement were added to increase the number of patients. These patient groups were selected because substantial pain is associated with these procedures. Within each surgical group there were variations in procedures. For example, anal surgery consisted of patients undergoing hemorrhoidectomy, anal repair, fistulotomy, and the removal of anal warts, tags, and cysts. The arthroscopic group included mainly patients undergoing arthroscopic knee surgery viz. anterior cruciate ligament repair (ACL), arthroscopy, meniscectomy. Also included in the arthroscopic group were bunionectomy and one rotator cuff and three Achilles tendon repairs. Hernia repairs were inguinal, ventral, umbilical, abdominal and incisional.

2.2. Pre-operative procedure

All patients were given a letter explaining the study and invited to take part. Patients belonging to 15 surgeons were involved in the study. Two surgeons in the surgical unit did not want their patients to be part of the study so their patients were not included. Patients who were under 19 years of age, could not read or write English, or were not willing to fill out the pain diary or be telephoned at home were excluded. If the patient consented to be in the study the nurse researcher checked a pre-determined list of random numbers to determine if the patient was randomly assigned to the control or intervention group. The random numbers were selected using a randomized block design to ensure that equal numbers of control and intervention participants were scheduled for each of the four main surgical types.

After obtaining informed consent, a nurse researcher asked both intervention and control groups to complete the Spielberger State Trait Anxiety Inventory (State) [24] and the Brief Pain Inventory [25] and collected demographic data. Patients were also asked if they had anyone at home to help them after surgery and how much pain they expected to have. The intervention group was given pre-operative teaching about post-operative pain control and a pamphlet about pain management following surgery. The pamphlet was based on the guidelines for management of acute pain post-operatively from the Agency for Health Care Policy and Research [26]. The nurse researcher spent

between 10 and 15 min talking with each patient. Interviewing time was influenced by how much time was available prior to surgery.

During the pre-operative session, both intervention and control groups were given pain diaries and asked to complete them for four consecutive evenings, beginning with the day of surgery (day 0). The pain diaries asked them to indicate their level of pain, how many pain-relieving medications they were taking, the extent to which they were having problems with side effects such as nausea, vomiting, constipation, dizziness, grogginess and fatigue and how pain was affecting them. The diary also included, for both groups, questions about the helpfulness of the pain management advice given and the helpfulness of the written instructions. Diaries given to the intervention group also asked how helpful they found the follow-up telephone calls. To assist with compliance, patients were given stamped envelopes addressed to the researchers.

2.3. Post-operative procedure

Following surgery, both groups were given the usual post-operative teaching by the nurses in the surgical day unit, which included an instruction sheet with the surgeon's preferences for post-operative management. The researchers did not see the patients after surgery.

2.4. Telephone follow-up

The intervention group was telephoned on post-op days 1, 2 and 3 by the same nurse researcher seen in the day surgery unit. If necessary, repeat telephone calls were made until the nurse spoke to the patient. The nurse researcher reviewed a standardized protocol with the patient to assess the patient's pain and pain management. The protocol also assessed nausea, vomiting, constipation, dizziness and grogginess. If any of these symptoms were present, the nurse advised the patient how to manage the problem. For example, patients who had been prescribed acetaminophen with 30 mgs of codeine but not achieving satisfactory pain relief were advised to include ibuprofen as part of their pain management providing they had taken this medication before and they did not have any allergies. If the patient's pain was severe and not able to be relieved, then the patient was advised to phone their surgeon or general practitioner. During the telephone calls made on days 2 and 3, the nurse again reviewed the standardized protocol.

The patients in the control group also were phoned on day 2 and reminded to complete their pain diaries. To minimize any treatment interference, the control group was advised pre-operatively that they would be telephoned on day 2, and care was taken not to give them any advice about pain management.

All patients were telephoned on day 5 post-surgery and asked if they still had pain, if they were taking pain-relieving medications and if they still had any side effects, such as constipation, nausea, vomiting, dizziness, grogginess or fatigue. These data were recorded by the nurse and were not included in the pain diary but were part of the data analysis.

2.5. Measurement

Pain was measured by a numerical rating scale where no pain was 0 and 10 was the worst pain imaginable (the Brief Pain Inventory). This has been used in numerous studies and has established reliability and validity across a number of patient populations, was used both pre-operatively and post-operatively [25].

2.6. Demographic data

Of the patients who met the study criteria only three refused. Of the 254 patients who were enrolled, 16 became protocol failures because post-operatively they had to stay overnight in the hospital, they had left their diaries at the hospital or they subsequently were admitted to another facility. Of the remaining 238 patients, 222 mailed their completed pain diaries to the researchers. Table 1 represents the numbers of patients in each surgical group.

There were no differences between the control and intervention groups with respect to the demographic data. There were 135 males and 87 females in the sample, (Table 2). Many more males than females had anal surgery. The average age of the intervention group was 42.5 years and of the control group 41.4 years. Most of the patients were Caucasian (80.6%) with the remaining 19.4% describing their ethnic origins as Chinese, South Asian, Filipino, Latin American, Japanese or another nationality. The level of education ranged from primary school to graduate degrees (Table 3). Over half of the sample was married or living common law (53.4 %), while 31.7 % were single and the remaining 14.9% were widowed or divorced. When asked if they had anyone at home to care for them for a few days after their surgery, 86.9% of the patients indicated they did.

Table 1
Types of Surgeries by percentage

Hernia	14.4% (32)
Mammary reductions and enhancements	16.2 % (36)
Arthroscopies	31.1% (69)
Anal surgeries	38.3% (85)
Total	100% (222)

Table 2
Demographic data by gender

Gender	Control	Intervention	Total
Male	51.9% (70)	48.1%) (65)	100% (135)
Female	55.2% (48)	39 (44.8%)	100% (87)

Table 3
Level of education

Highest level of education	Control	Intervention	Total
Elementary School	2.5% (3)	0.96% (1)	4
Secondary School	28.8 %(34)	21% (22)	56
Trades Certificate/Diploma	33% (39)	48% (50)	89
University diploma/degree	35.6 %(42)	29.8% (31)	73
Total	100 % 118	100% (104)	222

2.7. Data analysis

Data were analyzed using SPSS (STATISTICAL PACKAGE FOR SOCIAL SCIENCES) computer software. Descriptive statistics were used to summarize the prevalence, severity, and effects of pain, the presence of other symptoms, pre- and post-intervention, and to profile patient characteristics (age, gender, marital status, presence of someone at home to help after surgery and level of education).

Two-sample t-tests were used to determine the differences between the control and experimental groups with respect to pain severity at each time point (from day 0 to 3). For all interval scale outcome items measured pre and post-intervention two sample t-tests were also used to compare the two groups with respect to the change score between each pair of time points (e.g. day 0−day 3). This analysis was also done for those items measured at day 5. For categorical variables (e.g. symptoms, and helpfulness of instructions, use of medications (yes, no), χ^2 tests were used to compare control and experimental groups.

3. Results

Using the SPSS, independent it-test analyses were performed to provide analysis for the following questions.

Question 1 addressed whether patients who received an educational intervention experienced lower levels of pain than those patients who did not receive an educational intervention.

From day 0 (the day of surgery) to day 3, the control and the intervention groups did not differ significantly with respect to level of pain (as measured by the item how much pain do you have right now) but by day 5, the intervention group had significantly less pain than the control group ($P = 0.04$). The mean level of pain for the intervention group at day 5 was 2.85, S.D. 2.30 and for the control group was 3.55, S.D. 2.63. Fig. 1. indicates the mean level of pain by day of surgery.

Questions 2 and 5 addressed differences between the intervention and control groups with respect to the presence of other symptoms experienced after discharge and changes in symptoms over time. There was no difference between the intervention and control group regarding experiencing other symptoms, which included nausea, vomiting, constipation, fatigue, dizziness and grogginess.

Question 3 addressed whether the rate of pain reduction over time differed between the two groups. The research found that the level of pain reduction between the two groups differed over time. Between day 0 and 2 ($P = 0.033$) and day 0 and 3 ($P = 0.016$) the intervention group experienced a significant decrease in pain over the control group. There was also a significant difference between the groups regarding change in pain when moving. Between day 0 and 1 ($P = 0.021$) and day 0 to 2 ($P = 0.057$) and day 0 to 3 ($P = 0.061$), the intervention group experienced less pain on moving than the control group.

Question 4 asked if the impact of the symptoms varied between the two groups. Impact included mood, sleep, relations with others, walking ability and concentration. On day 1 there were no differences between the control group and intervention group but by day 2 some difference had begun to become apparent, as the intervention group had better scores on their relations with others ($P = 0.05$) and on their concentration ($P = 0.01$). By day 3, the differences between the control and intervention groups approached significance for level of pain, pain when moving and relations with others. Of note on day 3 there were significant differences between the intervention and the control group regarding the

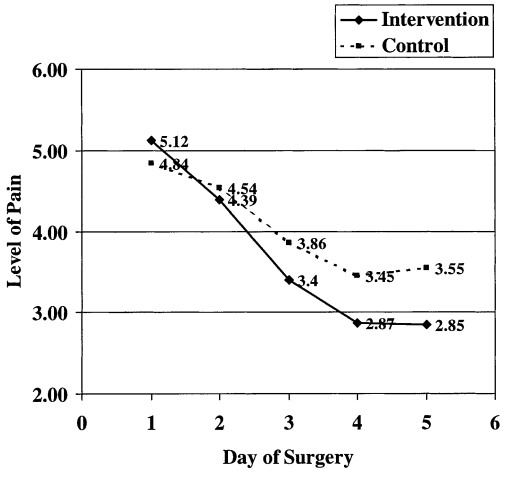

Fig. 1. Mean levels of pain by day of surgery.

effect of pain on mood ($P = 0.038$), walking ability ($P = 0.047$) and concentration ($P = 0.041$).

Questions 6 and 7 assessed the amount of medications consumed and if that amount differed over time between the two groups. There was no difference between the two groups regarding the number of medications consumed. On day 0 there was no difference between the intervention and control group with respect to the amount of relief patients obtained from pain relieving medications, but over time the intervention group indicated that they experienced more relief than the control group. By day 1 the difference between the intervention and the control group was significant at ($P = 0.028$) by day 2 at ($P = 0.042$), and it remained so by day 3 by ($P = 0.047$). The symptoms of nausea, vomiting, constipation, fatigue, dizziness and grogginess decreased over time and did not vary between intervention and control groups (See Table 4).

Question 8 assessed the effect of the patient characteristics (age, gender, ethnicity, education, level of anxiety, type of surgery) on patient's pain, other symptoms and number of medications consumed. The data obtained pre-operatively also asked how much pain they expected to have post-operatively. Patient characteristics did not impact on pain, other symptoms and numbers of medications consumed. There was no relationship between level of anxiety prior to surgery and level of pain experienced post-operatively. There were weak correlations between how much pain they had expected to have post-operatively and the amount of pain that they experienced over the 3 post-operative days.

There were no differences between the intervention and control groups prior to surgery as measured by the BPI [25]. Nor were there differences regarding the use of other coping methods used post-operatively between the two groups.

3.1. Helpfulness of instructions

In their diaries, patients in both groups were asked how helpful they found the written instructions. Of the intervention group 59.8% indicated that they found the written instructions helpful or very helpful as opposed to 36.8% of the control group ($P < 0.0008$). However, of the intervention group, 7.8% (nine persons) indicated that they had not read them and one person stated he/she did not receive them. In the control group 13.2 % (15 patients) indicated that they did not read the instructions and 14.9% (17 patients) indicated they did not receive any written instructions.

3.2. Pain management advice

The question on the pain diary related to pain management advice revealed positive results. Although 57.3% of the intervention group found the advice helpful as compared with 46.9% of the control group, a surprising 13.6 % of the intervention group indicated that they did not receive any pain management advice. The question for the intervention group assessing the helpfulness of the telephone advice yielded overwhelming support as 79.6 % said that they had found it helpful or very helpful.

There were no differences between the two groups with respect to other symptoms experienced or with respect to rates of recovery from the symptoms experienced. Table 3 reports on the total sample and the percentages of those patients reporting symptoms by post-operative day.

The anecdotal comments of patients were that they appreciated the telephone call and the support and concern of the pain research nurses and commented positively in their pain diaries. It was difficult to determine if patients gave the same message over the telephone as they did in their diaries.

4. Discussion

Patients appear to benefit significantly from telephone advice about how to manage their pain following day surgery. In this research the advantages of detailed advice were not immediately apparent as the differences in pain levels between the control and intervention groups were not clearly evident until day 5, although by day 3 the differences between the two groups approached significance with the intervention group

Table 4
Symptoms other than pain in the total sample by (%)

	Day 0	Day 1	Day 2	Day 3
Nausea	43.2 % (96/222)	27.2 % (59/217)	20.4 % (45/221)	14.5 % (32/220)
Vomiting	19.4 % (43/222)	7.8 % (17/217)	3.2 % (7/221)	1.8 % (4/220)
Constipation	21.7 % (48/221)	38.2 % (83/217)	37.6 % (83/221)	30.0 % (66/220)
Fatigue	72.5 % (161/222)	66.8 % (145/217)	59.3 % (131/221)	48.6 % (107/220)
Dizziness	51.1 % (113/221)	36.6 % (79/216)	20.8 % (46/221)	19.2 % (42/219)
Grogginess	63.3 % (140/221)	42.8 % (92/215)	28.1 % (62/221)	24.2 % (53/219)

experiencing less pain than the control group. As the patients reported that they felt unable to concentrate on the information very well during the first post-operative day, it could be that as time passed and their concentration improved they benefited more from the telephone advice. Law [8] also reported that patients had difficulty remembering verbal advice following day surgery. Questions developed over time, as the patients recovered and experienced problems in relation to their surgery, their pain, and the side effects of pain relieving medications. This contrasts to Moran's [10] findings that patients preferred earlier phone calls post-operatively and these calls were more effective than those that occurred later.

Although there were differences in pain levels between the intervention and control groups, there were no differences in the amount or level of other symptoms such as constipation. The focus of the intervention was on pain; it could be that these other symptoms were not affected by the intervention. Interestingly, there was no correlation between medications consumed and level of pain experienced but there was a relationship between the number of medications consumed and the presence of other symptoms such as constipation, fatigue, grogginess, dizziness and nausea. These symptoms decreased over time, as one would expect, but there was no difference between the intervention and control groups. It seems that pain affected the control group more than the intervention group and the intervention group got more relief from medications than the control group.

Significant numbers of patients reported fatigue. This is similar to the findings of Oberle [13] who reported that fatigue following day surgery persisted for several days. Other studies [27,28] reported that nausea and vomiting may persist for several days. Patients in this study did not report undue stress from these symptoms. It was difficult to determine the origin of these symptoms because most patients were prescribed acetaminophen with codeine, which has side effects of nausea and dizziness. Thus, it is difficult to distinguish symptoms that were part of the recovery and those associated with the medications.

The intervention group received more relief from pain relieving medications than the control group beginning at day 1, even though they did not take more medications. It could be that they felt supported and knew that support and advice were readily available, which impacted on the level of pain. Pain had less impact on the intervention group than on the control group in terms of mood, concentration, and relations with others. Again, it took time for the impact to be evident, as the differences between the intervention and the control groups were not apparent until day 3. Post-operative follow-up that occurs later in the post-operative recovery may be important, although Moran [10] found that patients preferred telephone calls nearer the time of surgery rather than later.

In contrast to Payne, Ghia, Levin and Wikles [29] this research did not demonstrate a relationship between pre-operative levels of anxiety and post-operative levels of pain. It could be that since both groups of patients had talked to the nurses, even briefly, their level of anxiety was reduced. Mitchell [30] found that 72% of patients' anxiety is reduced by being near and speaking to the nurse.

The time of discharge is a difficult one for patient teaching. The nurses in the day surgery unit had many demands on their time. They were admitting patients prior to surgery and caring for them as they returned from the recovery room as well as discharging them. Time for additional information and teaching is limited. As well anecdotal information from the patients in this study indicated that they were not alert enough to absorb substantial information and would not have been able to think of future concerns or problems. Hence the follow-up telephone calls were very helpful. Information provided well in advance is helpful and Mitchell [30] found that 99% of patients required both written and verbal information prior to ambulatory surgery and most wanted it 1–3 weeks prior to surgery.

The advice must be specific enough so that it can be helpful, for example, explaining to patients the importance of keeping their pain under control. The need for explicit advice has been determined in other studies. Fox [14] found that patients did not want to be told to 'take it easy' and receiving a list of instructions from the surgeon was inadequate to meet their requirements for information. They required more specific information and instruction about exactly what they could and could not do.

Patients in this research reported that written instructions were helpful, but not all patients followed written instructions. Some patients claimed that they were given advice that was not clear and two people misunderstood the information that they were given. Patients reported that they did not always read the information that was provided. Fewer of those in the intervention group (7.8%) than in the control group (13.2%) reported that they did not read the written information. The telephone calls possibly provided motivation to read information but also the intervention group received two types of written instructions-the pamphlet given by the nurse researcher and the surgeon's instructions given by the hospital. They were not asked to differentiate between the two in the diaries. This suggests that either the additional pain management pamphlet or the pamphlet in conjunction with the telephone support assisted the patients to find the written instructions more helpful. It could be that multiple messages were beneficial for the intervention group.

Mitchell [30] found more extensive written information-reduced patient's contact with a general practitioner but also found that a small percentage of patients (7%) did not read all the information.

When the patients, both intervention and control groups, stated they did not remember being given any advice about pain management, it could be that the patients had difficulty understanding what is meant by the term advice or that the question is too ambiguous. Law [9] (p. 358) also identified that some patients did not understand what was meant by the expression 'What advice were you given?' This has important implications for future surveys in assessing what patients think of post-operative advice.

Patients in this study were a heterogeneous group. Some of the procedures may have been more painful than others. Even within the four categories listed in Table 1, there was variation in the procedures performed. The research relied upon the patients' self reports of the number of medications that they were taking and the amount of pain and other symptoms experienced. Some of the patients had had surgery before and we did not factor this into the study. We did not intervene during the post-operative discharge process and we do not know if the follow-up instructions were given to family members or to patients alone. The nurses in the day surgery unit were under pressure to discharge patients as they were not able to keep them overnight and this may have contributed to variation in the discharge information that patients received. For the most part, the nurse who gave the pre-operative teaching instructions telephoned the patients at home, so a rapport was established. In practice this may not be realistic with nurses schedules and the numbers of operations performed.

5. Conclusion

Telephone intervention was effective in impacting on patient's pain post-operatively. Patient teaching needs to include information about the side effects of medications and how to manage them and about the importance of seeking help or advice. This study lends strong support that patients need accessible follow-up care and that telephone advice is an acceptable means of providing such advice. There is a need for resource persons to assist patients by re-enforcing and clarifying instructions and providing encouragement and even emotional support. This information suggests that teaching needs to be re-enforced when patients actually have problems and those at home need access to follow-up information as well as coaching and encouragement.

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Inhalation versus intravenous anaesthesia for day surgery☆

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Abstract

Opinion is often fiercely divided over the relative merits of intravenous or inhaled anaesthesia for day case procedures. Advocates of intravenous anaesthesia claim superior recovery and minimal side effects, yet inhalational agents remain popular and are widely used for their excellent operative conditions and low costs. This review will consider the recent evolution in both inhalation and intravenous anaesthesia and will describe what are probably the optimal techniques for the delivery of each. Possible advantages and disadvantages of these approaches will be discussed and the outcomes examined. In reality, recovery characteristics are very similar with either of the two techniques and where differences do exist, they are of minimal importance. Costs may differ, but again the differences are small and frequently absorbed within the far greater overall costs of the procedure. Postoperative nausea and vomiting (PONV) is the most contentious outcome and this will be examined in some detail. While most evidence would favour intravenous anaesthesia in this respect, the magnitude of the advantage may be overestimated and strategies for reducing side effects after inhalation anaesthesia to acceptable levels will be presented. Finally, the future of day case anaesthesia will be considered, with the unfortunate conclusion that the supply of exciting new anaesthetic agents appears to be exhausted, at least for the present.

Keywords: Anaesthesia: ambulatory inhalation, intravenous; Anaesthetics; Propofol, sevoflurane, remifentanil; Complications; PONV

1. Introduction

There has long been a vigorous debate between anaesthetists over whether inhalational anaesthetics or intravenous anaesthesia techniques are best for day case patients. The principal issues concern speed and quality of recovery, side effects (especially nausea and vomiting) and costs. These discussions usually occur between individuals who are enthusiasts for one or other technique and who may well have 'vested interests' in the form of research funding or speaker fees. While I cannot consider myself free from such bias, I will attempt to present a relatively balanced view.

Historically, the earliest anaesthetics were of course inhalation agents and some of the first anaesthetics were given for day case procedures. Much has changed since then, and enthusiasm for inhaled and intravenous anaesthetics has oscillated as new drugs have been developed. For its time, cyclopropane was an excellent day case anaesthetic [1], allowing rapid induction and short recovery times from a 'total inhalation' anaesthetic. The demise of this highly explosive drug was partly brought about by the increasing use of electrical equipment, otherwise it might have retained its place for longer.

With the advent of propofol, there was renewed interest in intravenous anaesthesia; indeed it looked as if halothane, enflurane and isoflurane would become obsolete [2]. While propofol and total intravenous anaesthesia (TIVA) retain an important place, they failed to gain as widespread popularity as was initially thought. With the advent of relatively insoluble inhaled anaesthetics, such as desflurane and sevoflurane, the pendulum has again swung back towards the inhalation side, although it currently rests somewhere in the middle.

☆ Based on a lecture delivered at the Fourth International Congress of the International Association for Ambulatory Surgery, Geneva, April 2001.

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2. Where are we now—the state of the art

2.1. Inhalation anaesthesia

Modern inhaled anaesthetics suitable for day surgery have low blood:gas solubilities. As a result, they have a fast onset of effect and allow for a rapid recovery. Although general anaesthetics have a multitude of actions, the newer agents are relatively 'clean' drugs, producing minimal depression of respiratory and cardiovascular systems. They relax voluntary muscles to a useful degree. They are safe in most patient groups, although they can still trigger malignant hyperpyrexia. A further advantage of these agents is that they permit excellent control of anaesthetic 'depth'. This is primarily a result of their low solubility, allowing changes in delivered concentration to rapidly achieve the desired effect. This is enhanced, in the case of sevoflurane, by low airway irritability, permitting the delivery of high concentrations without provoking coughing or laryngospasm. Good control allows the level of anaesthesia to be closely matched to the level of surgical stimulation, so that the patient is 'as deep as necessary, but as light as possible'. This helps to minimise adverse effects and promote rapid recovery.

In my opinion, the optimum inhaled day case anaesthetic involves the use of sevoflurane in a 'total inhalation' technique, sometimes referred to as Volatile Induction and Maintenance of Anaesthesia (VIMA). With VIMA, patients can undergo a smooth and painless induction of anaesthesia. While not always quite as rapid as intravenous propofol, this technique minimises hypotension and maintains spontaneous ventilation [3]. As equilibration with the inhaled anaesthetic occurs during the induction phase, the level of control is enhanced compared with the use of inhaled agents after an intravenous induction [3]. Opioid analgesics are rarely needed to suppress intraoperative responses; indeed their use may be detrimental in preventing spontaneous ventilation and, more importantly, increasing the incidence of postoperative nausea and vomiting (PONV) [4]. Immediate recovery may be faster than when an intravenous induction agent is used, at least after relatively short procedures [3,5]. This benefit has not been observed after operations lasting approximately 30 min, however, [6]. Although early comparative trials suggested a moderate level of patient dissatisfaction [3], increasing experience has shown the technique to be popular with most patients. Above all, the VIMA technique has an elegant simplicity which appeals to this author. It can be used with tracheal intubation, but works delightfully with the laryngeal mask airway (LMA).

2.2. Intravenous anaesthesia

There is really only one modern intravenous anaesthetic worth considering for day surgery and that is propofol. It is far removed from the early barbiturates, with a rapid onset and a short duration of action. Anaesthesia can be maintained for as long as necessary by an infusion, but recovery is rapid once this is terminated. Again, this short duration facilitates adjustments to anaesthetic depth, thereby enhancing control. Propofol is also a relatively 'clean' drug with few unwanted side effects. It rarely provokes allergic actions and is safe in epilepsy, porphyria and malignant hyperpyrexia. Indeed, unlike inhaled anaesthetics, which tend to produce a degree of analgesia (especially nitrous oxide) and relaxation of muscles in addition to hypnosis, propofol is a more specific hypnotic. As a result, a balanced approach is generally adopted, adding opioids for analgesia and neuromuscular blocking drugs, if and where required.

The optimum intravenous anaesthetic probably involves the combination of propofol and remifentanil. Both hypnotic and analgesic components are short-acting, necessitating delivery by continuous infusion. Target-controlled infusion (TCI) systems, using a syringe driver programmed with population pharmacokinetic data, simplify the delivery of propofol [7]. Remifentanil has such a short half life that changes to the infusion rate will rapidly produce a proportional change in the blood concentration, ensuring good control. This means that bolus administration is almost never required and manual infusion schemes are quite satisfactory. However, prototype TCI systems have been developed for remifentanil.

A variety of combinations of propofol and remifentanil are possible. At one extreme, a high propofol concentration will achieve a relatively deep level of anaesthesia, supplemented by a small analgesic component. At the other extreme, a high opioid concentration will block arousal resulting from noxious stimuli, requiring only a low concentration of propofol to ensure unconsciousness. While most combinations produce adequate anaesthetic conditions, recovery is fastest following high-opioid, low-hypnotic combinations; a consequence of the very rapid metabolism of remifentanil. Care must be taken not to reduce the hypnotic component too much, however, or awareness is possible [8]. This may be difficult to detect, as remifentanil blocks most clinical signs of light anaesthesia.

The brief duration of remifentanil is due to its metabolism by non-specific blood and tissue esterases. Recovery from remifentanil is virtually independent of infusion duration, age, hepatic or renal function and genetic disposition [9]. Propofol is short lasting more by virtue of redistribution, but its kinetics are also relatively unaltered by moderate levels of organ dysfunction. Both

drugs can decrease blood pressure, but hypotension can be minimised by the use of infusions rather than bolus administration. Remifentanil is a potent respiratory depressant, but ventilation can be readily controlled in combination with propofol. The airway can usually be managed with the LMA, but tracheal intubation is possible at higher remifentanil infusion rates (with propofol). Neuromuscular blocking drugs are seldom required for day surgery. Perhaps the greatest advantage of this technique is that it can be adapted to virtually any procedure which is likely to be performed on an ambulatory basis.

Loss of the spontaneous respiratory rate and pattern reduce the level of clinical monitoring of anaesthetic 'depth'; a disadvantage in this author's opinion. This TIVA technique is also inherently more complex, placing reliance on mechanical ventilation, infusion pumps and drug infusion lines. It is important to remember that there is no measure of drug delivery with TIVA (as there is with inspired anaesthetic agent monitoring), making regular inspection of infusion lines and syringe pumps mandatory.

3. Advantages and disadvantages

Despite claims to the contrary by enthusiasts, emergence, recovery and discharge times differ little, irrespective of whether day case anaesthesia is maintained by intravenous or inhaled anaesthetics [10]. The newer inhaled agents may result in more rapid emergence compared with propofol [11–13], but the differences are small in magnitude and of little significance. Rarely, PONV resulting from inhalation-based anaesthetics (see below) may delay discharge [13], but this is unusual, even when these symptoms occur substantially more frequently compared with propofol [5,12,14].

Some comparative studies have shown inferior operating conditions with intravenous techniques compared with inhalation anaesthesia [13,15,16]. However, this was probably the result of sub-optimal analgesia in the intravenous group, a consequence of trying to achieve a 'fair' comparison between fundamentally different techniques. With the optimal drugs, both techniques achieve satisfactory operating conditions and good control. Both end-tidal concentration and predicted blood propofol levels provide some guide to anaesthetic adequacy. While the former is measured and the latter calculated, the correlation with actual blood concentrations is similar for each and titration to clinical signs is essential. As mentioned previously, however, the measured end-expired concentration does provide a useful confirmation of drug delivery.

Personal preference is undoubtedly important in determining the selection of intravenous and inhaled techniques. Considerations include previous experience and biases, an inclination towards a simple or complex approach and the choice of controlled or spontaneous ventilation. Mask and needle phobias amongst patients and availability of suitable infusion pumps and vaporisers may further influence the choice of technique. Some concern has been raised about the possible polluting effect of inhaled anaesthetics. Occupational exposure remains at safe levels in operating areas equipped with efficient scavenging systems, even when inhalation induction is practised [17]. The effect on the wider environment is more debatable, but modern inhaled anaesthetics have little impact on ozone levels and are not greenhouse gasses. Nitrous oxide (N_2O) is not so benign, however, [18]. The impact of discarded plastic syringes and infusion lines should also be considered when this subject is debated.

4. Postoperative nausea and vomiting

PONV is the issue most frequently raised when intravenous and inhaled anaesthetics are discussed. It is also one of the outcomes most feared by patients and should not be taken lightly. Aside from the unpleasantness, its management may increase costs, distract nursing staff from other duties, delay discharge and even necessitate overnight admission. The vast majority of comparative studies show a reduction in vomiting with propofol anaesthesia compared with the use of inhaled agents [19]. What is in dispute is the magnitude and significance of this phenomena and whether simple measures can limit the occurrence of PONV with inhalation anaesthesia.

One meta-analysis revealed a 20% reduction in PONV occurring within the first 6 h when propofol was used in patients at relatively high (20–60%) risk of emetic symptoms [20]. In patients already at low risk ($\leq$ 20%), the effect was negligible [20]. In contrast, one recent large study failed to find a protective effect of propofol in high-risk patients [21], seeing only a small benefit in those already at low probability of PONV. Furthermore, propofol may only have an effect on early PONV, perhaps due to its relatively brief half-life. The effect of propofol on late PONV was too small to be considered clinically relevant [22]. This may explain why reductions in PONV following propofol rarely translate into earlier discharge times.

A further problem compounding this issue is that comparisons between intravenous and inhalation anaesthetics seldom have PONV as their main focus. Individually, they lack sufficient power to rule out false positive results and other perioperative risk factors for PONV have rarely been controlled for. With broadly similar results obtained from a great many trials, we can be more confident in our conclusions, but the possibility of error cannot be excluded. Perhaps more importantly,

direct comparisons rarely deliver an optimum technique to each group. For example, in some of my own studies, the retention of spontaneous ventilation was desirable to facilitate blinded observation [13] or clinical comparison of anaesthetic adequacy [5]. In consequence, the intravenous groups received only small bolus doses of fentanyl, which may have artificially lowered the incidence of PONV. In contrast, opioids were also given to the inhalation groups, in whom they were not clinically required. Subsequent experience has shown that the mandatory administration of opioids in association with a VIMA technique results in a 25% incidence of PONV compared with only 8% when opioids are avoided [4]. Furthermore, opioids appear to increase the severity and duration of PONV, with 12% requiring antiemetic therapy in the presence of opioids compared with only 2% in their absence [4].

The incidence of PONV may be further diminished by the use of prophylactic antiemetics. The need for such preventative measures needs to be balanced against the underlying incidence of PONV in the population(s) of interest and the risk:benefit ratio of the particular antiemetic. Recent evidence suggests that dexamethasone is an effective and long lasting antiemetic agent, which is relatively inexpensive and virtually free from adverse effects at the doses used (typically 4–8 mg) [23]. It may also contribute some analgesia, a useful benefit. At present, there are no studies comparing PONV following optimised intravenous anaesthesia with that following VIMA plus dexamethasone.

5. Costs of inhaled and intravenous anaesthesia

Another area of contention concerns the costs of these anaesthetic techniques. It must be remembered that the cost of anaesthetic drugs is extremely low in relation to the overall cost of an ambulatory surgical procedure [24]. Nevertheless, anaesthetists may only be concerned with their own budgets, in which case differential costs assume greater importance. The cost of intravenous drugs are directly proportional to dose, which in turn is related to patient weight. A further factor is the degree of wastage occurring from packaging of intravenous anaesthetics in discrete sizes of ampoule or prefilled syringe. In contrast, inhaled anaesthetic costs are largely related to fresh gas flow rates. Gas flows can readily be reduced to 1 l/min without any noticeable disadvantage, while providing considerable savings. With the use of such low fresh gas flows, the direct cost of inhaled anaesthetics have always been lower than those of propofol. Recently, the situation has changed somewhat, in that the cost of both isoflurane and propofol have reduced substantially in most markets, through the availability of generic products. The newer anaesthetics, sevoflurane and desflurane, still retain patent protection, so their costs have remained higher. The direct cost of a generic propofol anaesthetic may now be lower than anaesthesia with sevoflurane. However, prefilled syringes of propofol, which are required by commercial TCI systems, are somewhat more expensive (and may result in considerable waste) and the use of remifentanil may also increase direct costs.

It has often been argued that the higher direct costs associated with intravenous anaesthesia may be offset by indirect savings [25] due to faster recovery and reductions in PONV. In practice, faster recovery is seldom observed and, even when the expense of treating PONV is taken into account, drug costs are still considerably higher with intravenous anaesthesia [5,21]. Other indirect costs should be considered too, such as possible differences in staff workload resulting from postoperative side effects. Such issues are exceedingly complex [24], but there is little evidence that intravenous anaesthesia reduces staff costs in practice. Some have tried to suggest that scavenging systems and even anaesthetic machines would not be required if only intravenous anaesthesia was used, thereby significantly reducing costs. The requirement for controlled ventilation probably dictates the availability of some form of anaesthesia machine and the requirement to deliver just one inhalation anaesthetic would necessitate a scavenging system.

6. Anaesthesia of the future

The past two decades have seen phenomenal developments in day case anaesthetic drugs. Can we expect similar advances to continue and will the future favour intravenous or inhaled delivery?

In theory, there is great potential for new intravenous drugs. As the mechanisms underlying anaesthesia are elucidated, it should be possible to produce ‘designer drugs’, able to interact selectively with the appropriate receptors. It is likely that such complex molecules would have to be delivered intravenously. These future agents might be expected to produce the individual components of anaesthesia with little, if any, depression of other organ systems. Even current intravenous agents are more specific than their inhaled counterparts, although the ‘one-drug-does-all’ nature of volatile anaesthetics can be quite useful at times.

Intravenous steroid anaesthetics have long shown great potential, but their history is a sad one of anaphylaxis, difficulty in solubilisation and stability and unwanted side effects. Perhaps some of these problems may be solved in the future. GABA is certainly an important mediator in sleep and arousal, so better understanding of its receptors and development of new benzodiazepines may eventually lead to improved anaesthetics. Nevertheless, despite the considerable

potential for intravenous anaesthesia, there seems to be precious little currently undergoing clinical trials.

All of the current volatile anaesthetics were synthesised long ago. The many other drugs in these chemical series have all been subjected to basic screening and evaluation, so we should not expect any new agents soon. Nevertheless, desflurane and sevoflurane were both initially sidelined because of manufacturing difficulties and concerns over toxicity, respectively. These concerns were ultimately unfounded, so perhaps some other promising agent has been overlooked for similar reasons.

The only new general anaesthetic currently undergoing clinical investigation is an inhaled agent. Xenon, has long been known to possess properties which would make it an attractive day case anaesthetic. The blood:-gas solubility of xenon may be as low as 0.115 [26], suggesting impressively rapid induction and recovery. The MAC of xenon, 71% [26], is quite high, preventing the effective use of overpressure. While inhalation induction with one MAC xenon is substantially faster than that with one MAC sevoflurane [27], the latter is typically administered at over four MAC and can result in even faster loss of consciousness [28]. Nevertheless, xenon is odourless and well-tolerated and combinations of sevoflurane and xenon for induction would be interesting. Recovery times are impressive, with emergence and orientation following prolonged inpatient procedures occurring considerably earlier following xenon anaesthesia compared with either isoflurane–N_2O or sevoflurane–N_2O [29].

Unfortunately, there are problems with xenon. As a noble gas, it is available only from natural sources and supplies are severely limited. The concentration of xenon in atmospheric air is 0.086 ppm and currently about 6 million l/year are produced by air liquification and purification [26]. Although collection is likely to increase, much is already earmarked for other medical uses and the aerospace industry. Consequently, the already high price is likely to increase further. The expense and rarity of xenon means that it is never likely to be widely used in anaesthesia, perhaps being reserved for patients with severe cardiac dysfunction, in whom it may be especially beneficial [26]. Sadly, xenon is unlikely ever to be cost-effective in day case surgery, since almost all the expense is incurred during the initial uptake phase [30], making it relatively more economical in longer procedures.

7. Summary

In conclusion, it appears that we already have excellent day case anaesthetics which can be delivered either by inhalation or intravenously. With an appropriate choice of drug and technique, there is probably little to choose between the two routes of administration and personal preference and prior experience heavily influence the choice. Recovery characteristics are generally favourable with either technique and costs differ relatively little. Furthermore, when the cost of anaesthetic drugs are seen in relation to total expenditure, these agents all represent extremely good value for money.

TIVA with propofol usually does have an advantage in terms of PONV, although the differences may not be as great as is often suggested. Users of inhalation anaesthesia are obliged to take greater care in eliminating other, unnecessary, causes of PONV (especially opioids) and must regularly audit the outcome of their specific patient populations to ensure that the incidence of side effects remains acceptable. The use of prophylactic antiemetics may need to be considered, but should not always be necessary. We will probably all have plenty of time to fine-tune the delivery of our own particular favourite day case anaesthetics, since any new agents seem unlikely in the foreseeable future.

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Convalescence after laparoscopic sterilization

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Abstract

To describe the convalescence after laparoscopic sterilization (LS), 76 female patients in Denmark completed questionnaires and diaries. Work was resumed 5 days and recreational activity 3 days after the procedure (median). Impairment of activities of daily living was pronounced only on days 0–2. Women should expect to resume all activities within 5–6 days after LS.

Keywords: Sterilization, tubal; Laparoscopy; Activities of daily living; Anaesthesia, local; Anaesthesia, general; Convalescence

1. Introduction

Convalescence after laparoscopic sterilization (LS) is poorly described with respect to late post-operative pain, impairment of functions of daily living and return to work or major recreational activities. In addition, recommendations for duration of sick leave and level of activity in the post-operative period differ widely [1]. Fraser et al. described that post-operative pain limited function of daily living in 40% of women 1 week after LS [2], whereas Eriksson et al. [3] described that more than 90% of patients had returned to normal activity after 3–4 days. The patient population undergoing LS consists of young women, and therefore recommendations for duration of convalescence and activity level may have substantial socio-economic implications. We have therefore described factors limiting early return to normal activities in a population given uniform recommendations for a short convalescence, after elective LS under standardized surgical conditions.

2. Methods

The setting was the gynaecological/obstetrical department at a public university hospital in Denmark. All patients scheduled for elective LS in the period 16-07-1996 to 10-06-1997 were asked to participate in a randomized, double blind placebo controlled clinical trial of ropivacaine for multiregional supplementary local anaesthesia (port site infiltration, salpinx/mesosalpinx block and intraperitoneal instillation, totally 285 mg), supplementary to general anaesthesia; the patients in the placebo group received no local anaesthesia. All patients received general anaesthesia with tracheal intubation, including propofol for induction and maintenance, alfentanil and atracurium. The mean duration of surgery was 14 min. Post-operative analgesia consisted of ketorolac 30 mg i.v. administered at induction of anaesthesia, and ibuprofen 600 mg p.o. 6 and 12 h post-operatively. For supplementary analgesia ibuprofen 600 mg p.o. was given, and as rescue analgesic 10 mg of morphine was given i.m. or i.v. No antiemetics were prescribed routinely. Eighty-one patients participated in the original study, which reported with less pain, less post-operative nausea/vomiting and reduced need for analgesics in the immediate post-operative period in the local anaesthesia group [4].

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2.1. Data collection regarding convalescence

Pre-operative data were collected by personal interview by the study nurse (DH), including occupation, primary recreational activity (PRA) and activities of daily living (ADL). The physical workload on job was classified by the patients and recorded by the nurse as follows: Group A (unemployed or on leave from work), Group B (light, e.g. sedentary work), Group C (moderate, e.g. light industrial or postal work), or Group D (strenuous, e.g. construction workers, nurses taking physical care of heavy patients). A similar classification was used in relation to the PRA. The ability to perform ADL (child care, car driving, stair climbing, cooking, house cleaning, and shopping) without difficulties was recorded. Detailed recommendations for convalescence were given as follows: Patients were told not to resume car driving within the first 24 h due to any residual sedation. Otherwise the patients were advised to resume all activities, including work and recreational activities within 48 h. Patients were told to postpone bathing in public swimming baths until sutures were removed for hygienic reasons.

Post-operatively, patients were asked to complete a diary daily for the first week. The patients were asked to assess their ability to perform ADL, and to state the reason if they were not performed without problems (such as pain, wound problems, nausea/vomiting or other reasons). In addition, patients were asked to record the time when work and PRA were resumed, and to state the reasons if longer than the recommendation (such as pain, wound problems, counter advice from general practioner, scheduled vacation or other reasons).

The main outcome measures were time to return to work and PRA. Descriptive statistics were used for demographic data. For comparison between groups Mann-Whitney-U-test was used for duration of convalescence, and χ^2-test with Yates' correction was used for frequencies; $P < 0.05$ was chosen as the level of significance.

The patients participated after written, separate informed consent for the main study and the present derived study. The study was approved by the regional ethical committee for Copenhagen and Frederiksberg Municipalities (KF 01-448/95) and the National Board of Health.

3. Results

Eighty-one patients were selected by the pre-operative interview. Four patients, however, stated that due to pre-operative medical reasons (lumbago, leg pain, pelvic pain from a previous pregnancy or unspecified) they would not be able to follow the recommendations, and thus did not want to participate in the convalescence part of the study. One patient was excluded when the laparoscopic procedure was converted to a mini laparotomy due to obesity.

Data for return to work or PRA were obtained from all 76 patients. The overall duration of absence from work was 5 days (median; range 1–17, interquartile range (IQR) 3–8), and the absence from PRA was 3 days (median; range 0–16, IQR 1–5). The relation between workload and return is shown in Table 1, the differences between different workload groups were not statistically significant ($P > 0.10$).

Fifty-three of 57 (93%) employed patients did not follow the recommendations to resume work within 48 h, and among these, 16 patients (30%) had a medical reason. Thirty-nine of the total 76 patients (51%) did not resume PRA within 48 h, and among these, 17 patients (44%) had a medical reason. The reasons, including non-medical ones, for not following the recommendations are shown in Table 2. Data for pre- and post-operative performance of ADL were obtained from 74 of 76 patients and are presented in Fig. 1. At the end of the first post-operative week all patients had resumed all activities at the same level as pre-operatively, except for 1 patient who experienced problems with shopping and house cleaning. There were no significant differences between ropivacaine and placebo groups with respect to convalescence at any time point or at any activity. Level of activity was maximally reduced on the day of the operation. On day two, when it was recommended that all activities should be resumed, house cleaning and shopping still caused trouble in 15% of the patients, see Table 3.

4. Discussion

LS is a common procedure in Denmark (5370 performed in 1999 with 5.1 million inhabitants [5]). The possibility of fast return to work is of major socio-economic importance, due to the age distribution of the patients and the frequency of this type of surgery.

Convalescence has not been sufficiently described, despite the frequency of the procedure and its potential for day case surgery. Both the duration of absence from work as well as performance of core ADL are central parameters. A precise characterization of convalescence is needed, including the method of calculating duration of convalescence (e.g. whether the day of surgery is included or not, objective criteria for performance of ADL and description of the social setting). To our knowledge, there are no comparative data on recommendations for convalescence after sterilization, and recommendations are thus based purely on traditions and personal beliefs.

Table 1
Return to work and PRA

Level of activity	Work, number	Resumed after, days		PRA, number	Resumed after, days	
		Median	Range		Median	Range
Light	25	5	3–11	22	1	0–13
Moderate	10	4.5	2–9	51	3	1–16
Strenuous	22	6.5	1–17	3	4	3–12
Overall	57	5	1–17	76	3	0–16

Table 2
Reasons for not following the 48-h recommendation for return to work or PRA

	Work, $n = 53$	PRA, $n = 39$
Planned vacation or weekend	23	5
Work load, as judged by patient	10	1
Agreement with employer	5	
No occasion for PRA		6
Medical counter advice	3	1
Pain	9	15
Wound problems	2	2
Fatigue	4	4
Other reasons	5[a]	2[b]
Total	61	36

[a] Anaesthetic complication (1), blurred vision (1), feeling bloated (1), hypertension (1), planned visit to physician (1).
[b] Anaesthetic complication (1), fear for falling (1).

It is important to realize that recommendations for convalescence and its actual duration after minor surgical procedures may depend on several non-medical factors. Among these are the insurance or economic compensation during sick leave [6], social customs, which are subject to considerable national and occupational differences, as well as patients' own expectations [7]. It may be important to know that in Denmark, the great majority of employed persons are entitled to receive their normal wage during sick leave and practically all hospital treatment in Denmark is provided by tax-paid public hospitals.

The recommendations in the present study, i.e. return within 48 h to all pre-operative levels of activity, were based on the assumption that this minor procedure would not cause extended problems, and it was considered a reasonable period, although not scientifically based. However, patients rarely followed this recommendation. The median duration of absence from work and PRA were 5 and 3 days, respectively, and only 4 of 57 employed patients followed the recommendation. There were no significant differences in duration of convalescence between the different groups of workload, nor whether patients received multiregional supplementary analgesia. Only 16 patients (30%) had a medical reason for not following the recommendation. Similar data have been presented after laparoscopic cholecystectomy [12]. The most frequent contributory reasons for not following recommendations were planned vacation or weekend immediately after surgery and strenuous work. The number of patients planning surgery before a weekend/vacation or obtaining special arrangements with their employers may reflect that the patients' own expectations will affect the duration of convalescence, or that the patients considered the recommended period of sick leave too short.

The ability to perform ADL is essential if recommendations for short convalescence are to be followed. Documentation of such activities is available from hernia surgery [13], but only to a very limited extent in LS [2] where pain at the end of the first post-operative week was reported to limit ADL in up to 40% of the patients. Figures for the duration of convalescence vary considerably from a mean 1.5 day [8] to 5.4 days [2], and pain is consistently an important factor for not resuming activities earlier [2,9–11]. This is in contrast to the data presented in this study and the study by Eriksson et al. [3]. They studied the effect of lidocaine gel covered sterilization clips +/−i.v. ketoprofen vs. placebo, and found a faster return to normal activity in the ketoprofen+lidocaine group than in the other two groups (93% after 2 days vs 60% in the other groups), in addition to less use of analgesics and antiemetics. However, neither descriptions of 'normal activity', nor the degree of impairment of ADL were described or discussed in this paper.

In the present study, virtually all activities were resumed at a pre-operative level at the end of the first post-operative week. Not surprisingly the level of function was primarily compromised in the first few days after laparoscopy. The activities primarily affected were house cleaning and shopping. However, even though performance of most ADL was normal in the great majority of patients after 2 days, other factors, such as expectations, planned vacations, agreement with employers and pain, postponed the actual return to work in the great majority of patients.

If performance of ADL in young women can be used as an indicator for ability to return to occupational activities, it would be reasonable to recommend a 2–3 days convalescence after LS. Furthermore, women

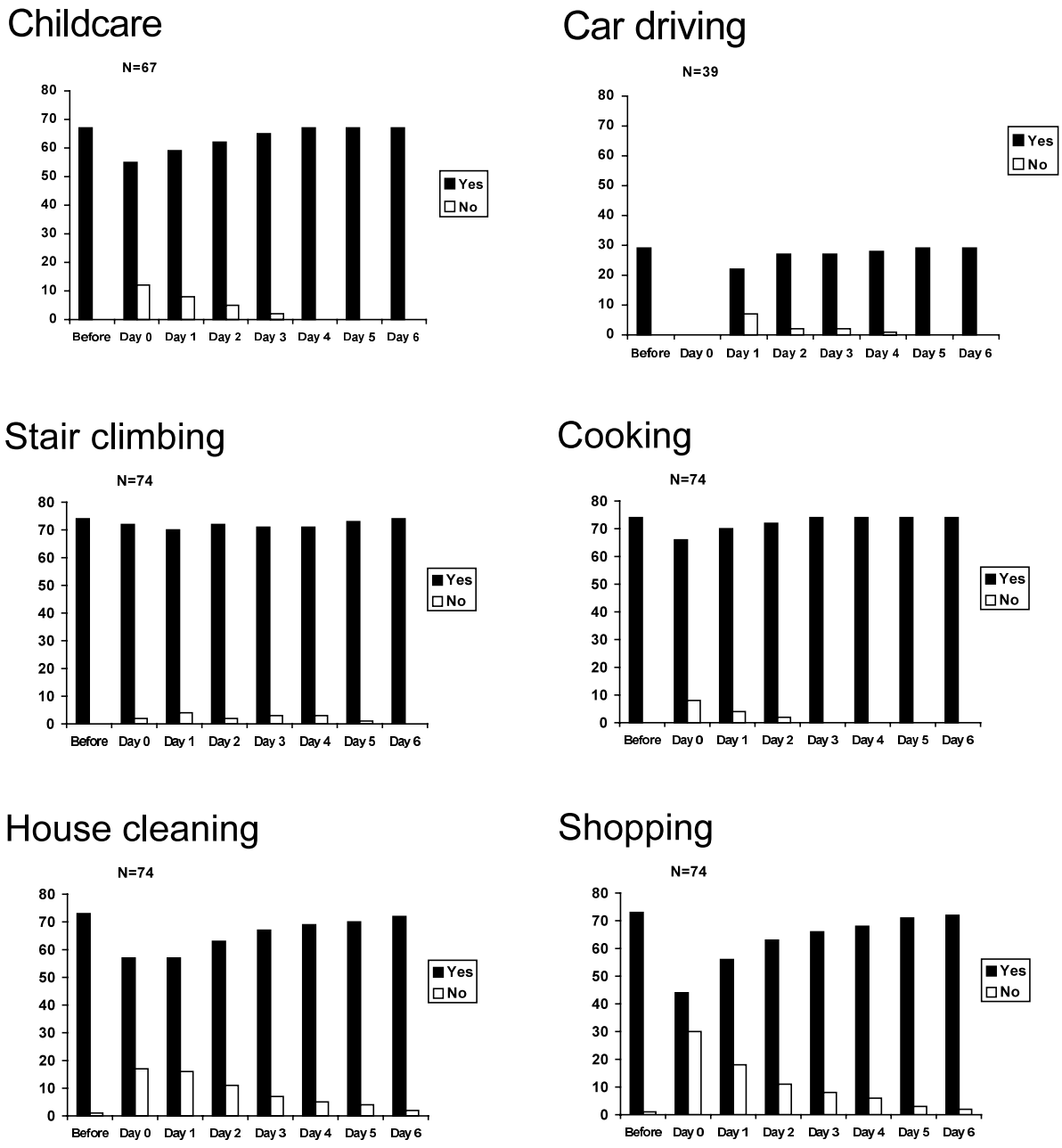

Fig. 1. Ability to perform ADL pre-operatively and during the first post-operative week.

Table 3
Contributory reasons for problems with shopping and house cleaning on day 2

	Pain	Wound	PONV	Other
Shopping, $n = 11$ (15%)	7	0	0	6[a]
House cleaning, $n = 11$ (15%)	6	1	0	6[b]

[a] Fatigue (3) feeling bloated (1), fear (1), pelvic pain from previous pregnancy (1).

[b] Fatigue (3) feeling bloated (1), pelvic pain from previous pregnancy (1).

undergoing LS may be told that they should expect to resume all activities within the first post-operative week.

For future research, the development of standardized recommendations for a short convalescence is necessary. As a quality control tool, it must include a simple method to report actual absence from work and recreational activities and the time until core ADL have been resumed at pre-operative level. Standardized information must also include realistic information to the patients about what to expect. In turn, this may clarify the influence of social factors, including economic compensation and patients' expectations.

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Patients' experiences of laparoscopic fundoplication in day surgery

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Abstract

Previous research has concentrated mainly on surgical aspects and postoperative complication rates after day surgery laparoscopic fundoplications (LF), due to gastrooesophageal reflux (GERD) and less on patients'experiences and nursing care aspects. A qualitative study was conducted aimed at investigating patients' experiences of day surgery LF. The very first patients who had day surgery LF ($n = 7$) were interviewed. The findings demonstrate that patients with GERD experience limitations in their daily lives and feelings of social handicap. At discharge after day surgery, amnesia was experienced and the respondents did not recall important information about the operation given by the surgeon. Experience of postoperative pain varied greatly. All respondents experienced dysphagia, vomiting, distension and bloating. The need for additional pain medication, additional follow-ups by the Advanced Medical Home Care team and extended preoperative information was expressed. However, the great majority felt that returning home on the same day as the operation was positive.

Keywords: Laparocopic fundoplication; Ambulatory surgery; Day surgery; Patients' experiences; Dysphagia; Amnesia; Pain

1. Introduction

Gastro-oesophageal reflux (GERD), has in a Swedish based study been reported by 15–20% of the population [1] and symptoms like heartburn, regurgitation and chest pain are common [2]. In a US-based study, 36% of the population was identified as having one episode of heartburn per month while 7% reported heartburn problems every day [3]. Sometimes complications such as oesophageal ulcer, oesophageal stricture, Barrett's oesophagus, malignancy and aspiration arise following long-term problems with GERD.

Traditionally, patients with GERD were treated symptomatically with dietary changes and antacids. Antireflux surgery, by means of laparoscopic fundoplication (LF) has been demonstrated to be superior to symptomatic treatment of GERD [3].

LF is in most cases today carried out on hospitalised patients who receive hospital care for about 1–2 days post-operatively. Although, complications such as dysphagia and bloating are reported [4], such a surgical procedure helps the patient to escape keeping to a diet and lifelong antacids medication [5].

Day surgery LF, is quite rare but there are some studies reporting on its efficiency [6–9]. Milford and Paluch [6] demonstrated that LF can safely be performed as a day surgery procedure if analgesic and anaesthetic management are tailored to minimize nausea and provide adequate pain control. Trondsen [8] reported that 31 of their 45 investigated patients were satisfied with day case LF. This type of surgery also results in a large national economic benefit due to fewer antireflux medications at less cost after LF and shorter hospital stay. Bloomston et al. [3] who investigated 100 patients showed that LF increased the patients' quality of life in relation to daily life activities such as food and sleep habits. For example, pre-operatively, coffee drinking aggravated 58% of patients' symptoms and after LF,

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83% of the patients reported no symptoms when drinking coffee. Ninety-one per cent of the patients avoided certain foods before LF for fear of exacerbating their reflux and 91% found it necessary to alter their sleeping habits before the operation to avoid symptoms. After surgery, 78% of the patients no longer abstained from such foods and 82% were able to return to their normal sleeping habits.

At the Huddinge University Hospital, a pilot study investigating patients who have undergone day surgery LF is ongoing. These patients come to the hospital in the morning, are operated on before noon and are discharged from the hospital the same afternoon. On the evening of the day of surgery and on the following morning, a nurse from the Advanced Medical Home Care team (AMHC) visits the patient in his/her home. The patients can reach the AMHC by phone 24 h a day and can have a visit within 30 minutes if needed. On the second postoperative day, a physician at AMHC calls the LF patient and decides whether to discharge the patient from the AMHC or not.

Day surgery LF is a rare procedure and studies so far have focused on surgical aspects and postoperative complication rates following LF, and less on patients' own experiences and nursing care aspects. The aim of this study was to explore the patients' experiences related to this type of day surgical procedure.

2. Methods

In this study a qualitative design was chosen since the intention was to explore variations of experiences of day surgery LF that may not be captured in a questionnaire. As the aim study was not to apply preconceived hypotheses in order to produce generalized data but focus on individuals' experiences, a qualitative approach can provide an illustrative description of previous unexplored phenomena [10], and engender a deeper understanding of patients' experiences in undergoing a new type of operation in this case LF performed in a day surgery setting.

The study was conducted at the department of surgery at a university hospital in Sweden. The very first patients, who were about to have LF performed in day surgery (2 women and 5 men) were recruited to the study via the hospital's outpatient surgery department. The age range was 31–67 years. They were asked about participation by the researcher at the time of the preoperative visit 1 week prior to surgery, when the surgeon, anaesthetist and nurse did the patient assessment.

The inclusion criteria for day surgery LF were that the patients must be American Society of Anaesthsiologists (ASA) grade I–II, have a positive attitude to a day surgical procedure and the company at home of an adult person during the first post-operative night. The patients received verbal and written information about the aim of the study, how it would be conducted as well as the surgical procedure and post-operative care. They also received the surgeon's name and telephone number. To fulfil the criteria for discharge from the hospital, the patients must be able to drink, void and not be in pain.

The main investigator (CB) collected the data during the period from February 2000 until October 2001. Interviews, lasting about 60 minutes, took place 1 week after the operation in an undisturbed environment in a room adjacent to the surgical department. They were audio-taped with the consent of the respondents and transcribed in their entirety. Each interview began with the question: 'What was your experience of having key-hole fundoplication as a day surgery procedure?' After that, the informants freely described how they experienced living with reflux disease, being cared for before the operation, the operation itself, and the first week afterwards. In response to how the informants described their situation, only clarifying questions were posed. According to Lincoln and Guba [11] data collection can be concluded when facts start to be repeated and when the researcher notes that themes and examples are no longer being enlarged upon. This occurred after seven interviews.

After having read through the text, categories were created through the repeated reading of meaningful text. Thereafter sentences were coded and important phrases and sensory impressions that arose during the interviews were written in the margins. Comments were written in the margins in order to draw further attention to important statements and to differentiate the themes. Categories, subcategories and themes were created through this procedure and by repeatedly going through the text. In order to provide additional elucidation quotations have been used [12].

2.1. Ethical considerations

All individuals' integrity was maintained throughout the study and they were informed that they could withdraw at any time from the study without any consequences for their future treatment and care. The study was approved by the Ethical Committee at the study hospital.

3. Findings

The respondents described different problems related to GERD as they experienced it before the operation, the day of surgery and how they felt during the first post-operative week at home. After coding and categorization of the interview statements, the following five main categories emerged:

- Living with GERD
- Anxiety and memory loss—experiences at the hospital on the day of surgery
- Pain and dysphagia—common experiences at home the first week after surgery
- A wish for a delayed period of follow-up by the AMHC
- Return to the activities of daily life

3.1. Living with GERD

Some patients had had problems due to GERD since they were young and others for no more than 3 years. Despite the disease duration, the patients had demanded antacid medication for heartburn for several years. All the respondents felt very motivated to have the operation to escape life-long medication. One man who had had problems for more than 40 years stated:

> I have had heartburn since I was young and often took bicarbonate until I underwent gastroscopies. Then I was prescribed another medication so I managed for a while. Ever since I was young I have had to vomit and then return home after having dinner out with friends. I understood that something was wrong. It got worse and worse and the physicians talked about gastritis.

A 55-year-old male builder's heartburn started when he was 20 and did military service:

> I was prescribed antacid medication but it only helped for a few hours and then the heartburn relapsed and I couldn't sleep at night. The heartburn started 30 minutes after having a meal and did not end before I was in a deep sleep at night.

A car repair-man who normally worked lying on his back in a horizontal position under the instrument panel and under cars stated:

> When I lay there on my back under a car, I often felt nauseous and I had to go and vomit and I haven't slept on my right side the latest five years.

One woman also had had heartburn for many years but she did not want to take medication for the rest of her life:

> I have had heartburn, it was burning, burning, burning. I didn't want to take omeprazole for the rest of my life. I read an article about heartburn. It was about a person who got cancer in her throat (after heartburn) I thought, why must I have heartburn if it is not necessary so I prefer to have an operation.

Some of the patients experienced the disease as socially handicapping because of difficulties in having dinner late in the evenings due to increased heartburn:

> I work as a computer consultant and I am often eating out with customers. As soon as I was stressed or ate late in the evenings, I had acid regurgitation, heartburn and experienced a pressure behind my chest, it hurt a lot. I think I had my first gastroscopy when I was sixteen.

The patients had undergone several gastroscopies and feared the disease to be malignant. One man experienced the following:

> I have had many gastroscopies, I didn't like it. I would rather have one more operation than a gastroscopy. I had tissue changes in my oesophagus, severe inflammation. If it is not cured, it can become cancer and I must take this medication for years because of my heartburn. Now it is marvellous to go to bed without heartburn.

3.2. Anxiety and memory loss—experiences at the hospital on the day of surgery

Some patients felt anxious before the operation but as these patients were the first to be operated on in the morning and the waiting time was short they could manage without tranquillizers:

> I felt anxious before the operation but I didn't want to show it...I said to the nurse that I didn't feel particularly encouraged.

Another man had a similar experience:

> I was a little bit anxious. Key-hole technique, I don't know what it is like. I don't know at all how they do it.

Some of the patients experienced amnesia after the operation and did not remember the information given by the surgeon on discharge:

> It is good to have a relative present who is alert because I did not remember much. I felt very bad when I was discharged. I really was swaying even though my wife was with me. I had pain, was dizzy and tired.

A woman shared the following with us:

> I felt funny, but at the same time everything was so obscure. I really don't remember anything. I had so much anesthesia left in my body, I remember very, very little.

Before discharge from the post-operative ward, the patients are expected to pass urine:

> It was very distressing not being able to pass urine by myself. They had to put in a urethral catheter before I went home.

Some of the patient's relatives were not satisfied that the patients were discharged the same day as the surgery was performed:

> My wife thought it was strange that I was discharged the same day as the operation.

3.3. Pain and dysphagia—common experiences at home the first week after surgery

After discharge and back home, the respondents were tired, experienced discomfort and a varying degree of pain. All of them had been prescribed medication for pain relief which was sent home in bags intended for the evening of the operation and the next day. One woman described pain in her shoulders, especially the left one:

> I thought it was OK until the evening when the effects of the anaesthesia had worn off and then I got a terrible pain in my shoulders especially the left one. When they came from AMHC, in the evening, they gave me morphine. I only could lie down in one position. I could not stand up, sit or move. The pain made me scream. It was unbearable. I still have pain after a week and I need pain medication.

And as described by a man:

> I felt pain in my heart and I thought it was my heart failing, but nothing happened. I had unclear pain in my stomach but it was only that day. I slept badly too. You sleep badly if you have pain. I felt miserable.

A man described pain related to breathing:

> It was painful to eat and take deep breaths even after one week. I have not full capacity yet, when I breathe I feel pain in my back over the lungs. I can take half breaths but I don't need more pain medication than what was sent home. But the first night after the operation I should have had something for nausea.

Dysphagia was a common problem experienced by all the patients during the first week after the operation. Before the operation the patients received information about eating small portions, to chew cachous, and not to eat too big pieces of meat that might get stuck. After the operation, the tissues are swollen. All of the patients experienced that it was not possible to eat as before the operation. Their food habits had to be changed. Most patients ate fluids and light meals for 3–4 days post-operatively:

> It's the food that is the problem. I can't recommend anyone to eat normal food. When I started eating on the third day, it was still hard to swallow even though I chewed more. The first meal lasted one hour and by then I felt bad.

One woman said that having a meal took a longer time than before surgery. It was difficult to swallow and chew:

> When I have swallowed twice it begins to hurt. Maybe I have not chewed enough. I have to stop. What I have swallowed comes up. It must come otherwise I can't eat or swallow anything. If I eat too fast it sticks and I swallow and swallow. After a while it ends with vomiting. The food does not go down it stops by the cardia. I have to chew and chew and drink until it is like gruel.

One man said that he began to work after a week and his problem was to have lunch. It was necessary to eat slowly, eat small portions and he had to leave some hours between meals so the stomach was empty before eating the next meal:

> When I began to eat more normal food it was problematic. I ate too much and it stuck. You have to be patient and learn to eat slowly. When I swallowed a too big piece of food it stopped down there. I have started to work. I used to eat a normal lunch but even a shrimp omelet is too much. I had to stop the car and vomit. It must be some time between meals and one has to learn to live with feelings of hunger.

One woman related almost the same experience:

> If a meal is too big, it doesn't work out well. Yesterday after I had had lunch, I had to go out and vomit. You have to realize that you must eat slower.

One woman thought about the future and wondered:

> Will the stomach expand so I can eat a little bit more. It would be fun to eat a three course meal again. Now I have only space for the first dish. I chew very carefully because it is very tight and the tissues are still swollen. One sandwich and I am full up. For several days I have eaten two sandwiches and one banana. There is no room for more because in that case I start to feel nauseous.

Several patients experienced problems with belching after a meal:

> My doctor described with an illustration, the procedure of this operation. He said there is a little pocket in the stomach of no use, which they stitch. I think it has something to do with the pressure. I would like to have it explained. I can't belch when my stomach is empty. This is something that I miss after the operation.

The patients experienced distention and bloating:

> I can't belch, that is unpleasant. You feel swollen. It did hurt a little and I was bloated. I took Microlax and it helped. I have rather more flatulence now.

Some patients experienced hiccups during the first postoperative week:

> I had hiccups when I drank something cold and than felt pain in my chest.

Weight loss depending on the difficulties in eating was reported by some of the patients:

> I feel it on my jeans. I have got thinner round my waist and my hips.

Another man had the same experience:

> I'm not hungry at all, I eat because I have to I have reduced my weight much since last week.

3.4. A wish for a delayed period of follow-up by the AMHC

Most of the patients were satisfied with the follow-up procedure by the staff from AMHC. They thought that they had received the care they expected. One patient was dissatisfied and wanted a delayed period of follow-up by AMHC as she suffered from prolonged pain:

> I would have preferred one more visit on the fourth day by AMHC. I had severe pain so it would have been good if they had come once more.

When the patients had questions about their operation, they did not know where to turn. They wanted to talk to the surgeon and not to the staff at the AMHC:

> Well, I received an information sheet from the AMHC about where to phone if I needed that, but do they have anything to do with my operation? I don't know whom to contact.

3.5. Return to activities of daily life

The patients are put on sick leave following LF of between 1 and 4 weeks depending on their type of work. If that period is not enough, the responsible surgeon has to be contacted for continued sick leave. None of the patients included in this study had recovered entirely after 1 week. A computer consultant had been on sick leave 1 week at the time of the interview:

> I had decided to work the day after the operation because I do not need to move much at work, no heavy lifting but I wouldn't have managed because of the pain.

All patients after six weeks have a return visit to the surgeon who had carried out the operation:

> I didn't know that I had a return visit after six weeks. Maybe they had told me and I had forgotten. I would have appreciated to meet the doctor one week after the operation to ask about the wounds and the infection and ask about why I had pain when breathing. I still have a terrible pain.

Despite his problems, a man stated that his parents had not understood what kind of procedure he had gone through:

> I have told them that it was a key-hole surgery but I don't think they have understood that it was a real operation but a smaller procedure. In their opinion, they thought that I should have had a return visit earlier due to my breathing problems, so I didn't have to worry so much. After six weeks, is there anything more to improve than take a look at the wounds? I would have liked information sooner if something was wrong. I have an extra incision, a sixth one and why are there bruises round the bandages?

Most of the patients felt that 1 week to recover and to be able to return to work was not enough:

> Entirely recovered is too much to say. I think it takes time before I can lift heavy things. I think I wait until the wounds are healed and I don't feel anything when I sneeze or cough. I can't say I am entirely recovered after a week it is too early but I feel all right when I do nothing.

The great majority of the patients were satisfied with the day surgery LF and felt that returning home on the same day as the operation was positive:

> It is easier for my relatives to visit me in my own home instead of at the hospital and for me, it's more comfortable to rest in my own environment.

4. Discussion

Over the past 10 years, the use of laparoscopic techniques has revolutionized surgery by means of benefit to patients and for economical reasons. Several studies investigating surgical technique and postoperative complications following day surgery LF have been undertaken [6,8,9] but studies focusing on quality of life and well-being after this type of procedure are rare. The aim of this study was to explore patients' own experiences of living with GERD and of the procedure performed in day surgery. This has to our knowledge not been performed before. Since the intention of this study was to explore variations in experiences of day surgery that may not be captured in a questionnaire, a qualitative design was chosen. Through their own stories, the patients included in this study conveyed in-depth knowledge concerning what it is like to undergo LF in a day surgery setting. Although the sample size is small, we find the results to be a valuable contribution to knowledge about patients' experiences of this operation.

Living with GERD has in this study been shown to affect patients' work life and social contacts and they were all positive to undergo surgery. Our patients had suffered from heartburn for several years and they demanded antireflux medication for acid reflux. Before LF, heartburn has been reported to be the most severe problem among patients suffering from GERD [3]. Following LF, extensive cost savings have been reported due to significant decrease in reflux medication usage [3]. This was also the case with our patients as none of them expressed any need for antacid medication post-operatively.

A well documented problem following general anaesthesia is amnesia [13,14] but this has not specifically been reported following day surgery procedures. In the present study, amnesia was a common and frustrating experience among our patients. Problems with amnesia have also been reported by patients who have undergone day case laparoscopic cholecystectomy [15]. We therefore recommend that the relatives picking up the patients, listen to the discharge instructions before leaving the hospital.

The patients in the present study experienced varying degrees of pain after the operation. Some of them were completely satisfied with the pain medications sent home for the first postoperative day. Others experienced a relapse of the pain on the third day, when there was no pain medication left. One of our patients still had distressing abdominal pain 1 week after the operation. Several other authors have also reported on pain following day surgery LF [6–9]. Trondsen et al. reported that five of their 41 patients were dissatisfied with day-case treatment because of excessive pain [8]. It is therefore of outmost importance for the patients to have access to adequate pain management and to the surgeon in charge [16].

Nausea and vomiting are other common symptoms after LF [6,8,9]. One of our patients experienced distressing nausea and would have liked antiemetic medication for the first night at home. In the study by Trondsen et al. [8], it was reported that one individual of 41 was admitted directly from the outpatient department because of nausea and six other patients reported significant nausea and vomiting. Milford and Paluch [6] reported that three of their patients failed to meet the discharge criteria due to complaints of unresolved nausea and 12 patients of 54 requested antiemetic agents.

Another problem expressed by one of our patients was transient urinary retention which was psychologically disturbing. This early common post-operative complication has also been described by Milford and Paluch [6].

Problems related to food intake were another common problem experienced by all patients in our study. All of them had to change their food habits. For some, gruel was the only food possible to swallow during the first week to avoid abdominal pain and vomiting. Other authors [6,8,9] have also reported dysphagia problems following LF, although in a quantitative way. Narain et al. [9] reported that dysphagia occurred in 13% and Bais et al. in 15% of their patients [17]. Trondsen et al. reported that one patient was readmitted on day five because of dysphagia and inadequate oral nutrition [8].

Patients planned for laparoscopic surgery need appropriate and timely delivered patient education. Sensory information given from the patients' perspective, like how it was going to feel, smell and look, have shown to reduce anxiety pre-operatively [18]. Hathaway [19] demonstrated that patients with great anxiety needed

more sensitive than technical information and Bailey and Clarke [20] found that combined sensory and technical pre-operative information helped the patients to use their own stress and coping strategies before an operation.

Our patients were given thorough information pre- and post-operatively both oral and written. However, the information did not seem to be perceived by the patients to be sufficient. In our study the patients requested more information about the implications of the laparoscopic technique and how life was going to be in the future. Trondsen et al. demonstrated that the majority of their patients were satisfied with the information given pre-operatively [8].

Despite the problems experienced by our patients, the majority preferred being in their own homes following this procedure rather than staying in hospital overnight.

5. Conclusions

A number of problem areas were expressed by the patients, e.g. pre-operative anxiety, post-operative amnesia, experience of pain, need for additional pain medication, feelings of nausea, vomiting, dysphagia, distension, bloating, wish for additional information about wound care and wish for further telephone follow-up by AMHC.

In further research, these issues need to be considered in planning and delivering nursing care. As this is a qualitative study describing patients' own experiences of day surgery LF, it is not apparent from this study how frequent these experiences are. It is therefore of great importance to investigate the frequency, intensity and distress of the described problems/symptoms. This will be investigated in an upcoming quantitative study on a larger group of patients following day surgery LF.

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Correlation between the evolution of the substitution index and anaesthetic quality indicators in a day surgery programme

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Abstract

Aim of the study: To evaluate the correlation between the substitution index, anaesthetic risk of the patients and anaesthetic quality indicators in our day surgery unit (DSU). *Patients and method*: From 1994 to 2001, 15 359 patients were operated on in our DSU. The substitution index per year and for every surgical procedure was calculated. The rate of patients with ASA risk of 2 or more was also calculated. Early admissions (patients not discharged from the DSU) and late admissions (patients previously discharged from the DSU) are considered as quality indicators. Statistical analysis was done by SPSS-Windows program (8.0 version) for the Pearson's correlation index for qualitative data. *Results*: The substitution index per year increased from 21.7% in 1994 to 53.10% in 2001. There was also an increase in the rate of patients with ASA risk of 2 or more (12.3% in 1994 and 56.12% in 2001). However, the rate of both early and late admissions was stable in the period of time considered, around 1.6%. In the statistical analysis, there was a linear correlation between the substitution index and the number of patients with ASA risk of 2 or more, but there was no correlation between the substitution index and the evolution of anaesthetic quality indicators. *Conclusions*: The increase in the substitution index and in anaesthetic risk do not worsen the rates of anaesthetic quality indicators considered.

Keywords: One day surgery; Anaesthetic quality indicators; Substitution index

1. Introduction

The substitution index in major ambulatory surgery has been increasing in Spain since programmes of this surgical modality began in the early 90s of the last century. In fact, major ambulatory surgical procedures done reaches at this moment a substitution index of around 60% in hospitals with fully developed day surgery units (DSU) [1,2]. Good results obtained in ambulatory patients allowed including in the programmes those with low to moderate anaesthetic risk and practising more complex surgical procedures [3].

Early and late admissions of the patients have been considered as quality indicators related to the anaesthetic procedures themselves [4]. The ASA classification adds the concept of anaesthetic risk for every patient.

The aim of the study is to evaluate the correlation between the substitution index, anaesthetic risk of the patients and anaesthetic quality indicators in our DSU.

2. Material and methods

From 1994 to 2001, 15 359 patients were operated on in our DSU. The following parameters were considered and calculated for the present study:

- Number of patients operated on every year in the DSU.

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- Percentage of patients operated on every year in the DSU with ASA risk of 2 or more.
- Substitution index per year (number of patients operated on in the DSU/number of patients operated on in the Hospital).
- Substitution index per year for every surgical procedure (number of patients operated on in the DSU for a procedure/ number of patients operated on in the Hospital for the same procedure).
- Percentage of patients with anaesthetic events in a year, which had resulted in early and late admissions. We considered as early admissions the patients not discharged from the DSU that required in-hospital stay, and late admissions the patients discharged home from the DSU and then admitted.

Statistical analysis was done by SPSS-Windows program (8.0 version). Results of the parameters considered are expressed in percentages and statistical comparisons were done by the Pearson's correlation index for qualitative data.

3. Results

Table 1 shows the results obtained after calculation of the rates corresponding to the parameters considered. They are expressed as absolute values and percentages. During the period studied, 15 359 patients were operated on in the DSU, with a linear increase over the years. The percentage of patients with ASA risk of 2 or more also increased (from 12% in 1994 to 56% in 2001). Since 2000, the more prevalent surgical procedures in the DSU (tonsillectomy, pilonidal cysts, knee arthroscopies, breast nodes and cataracts) reached a substitution index over 70%. Other surgical procedures like haemorrhoidectomies and varicose veins stripping were added to DSU activity from 1999.

Table 2 shows the overall rate of postoperative anaesthetic events and the specific incidence of the more frequent complaints of the patients, including pain, arterial hypotension, nausea and vomiting, headache and urinary retention. Overall rates of early and late admissions had a mean value of 1.6%, with a range between 0.8 and 2.9%.

The analysis of correlation (R) of the substitution index in a year and percentages of patients with ASA risk over 2 are shown in Fig. 1. There is a positive linear correlation ($R = 0.9$) between both parameters with a progressive increase of the substitution index and the percentage of patients with ASA risk of 2 or more.

There is no correlation between the substitution index and the percentage of anaesthetic events ($R = 0.01$), what is shown in Fig. 2. Note that there is a lineal and progressive increase of the substitution index, while the rates of anaesthetic events were stabilized.

4. Discussion

The results of the study confirm that it is possible to increase the surgical activity in the DSU including patients with higher anaesthetic risk, without impairment of the anaesthetic quality indicators considered.

The increase of the rate of patients with ASA risk of 2 or more reflects a rise in anaesthetic complexity in the DSU. In that sense, the implementation of new clinical guides for insulin-dependent diabetic patients and patients on treatment with oral anticoagulants have allowed us to include them progressively among the group of DSU patients. The development of systematic and easier schedules for treatment produced by our colleagues (endocrinologists and haematologists) have been essential for this progress.

The substitution index has not only increased due to the inclusion of more complex anaesthetic patients in the DSU, but new surgical procedures have been done in the

Table 1
Evolution of substitution index in the period studied

Years	1994	1995	1996	1997	1998	1999	2000	2001
Patients operated	390	1202	1639	1816	1963	2197	2977	3175
Patients with ASA risk ≥ 2(%)	12.3	18.1	24.5	28.1	33.3	33.6	49.2	56.1
Substitution index (%)	21.7	26.7	36.5	37.4	39.4	42.4	50.2	53.1
Substitution index (%) for								
Tonsillectomy	0	19.3	61.5	68.5	77	82.3	92.1	92.5
Pilonidal Cyst	19.7	66.2	70.9	83.7	70.9	83.7	85.6	76.1
Knee arthroscopy	3	31.7	49.5	63.6	62.9	70.8	76.7	85.1
Breast node	33.8	42.4	47.9	63.9	61.1	70.8	74.4	62.7
Cataracts	10.8	34.3	56.1	43.3	46.9	56.3	71.9	76.3
Haemorrhoids	–	–	–	–	–	–	46.2	85.2
Varicose veins stripping	–	–	–	–	–	42.4	49.3	52.4
Anaesthetic events (%)	0.8	1.7	2.9	1.7	1.6	1.2	1.1	0.8

Table 2
Postoperative anaesthetic events

Years	1994	1995	1996	1997	1998	1999	2000	2001
Anaesthetic events	0.8	1.7	2.9	1.7	1.6	1.2	1.1	0.81
Pain	0.3	0.0	0.1	0.1	0.1	0.3	0.01	0.2
Nausea and vomiting	0.3	0.8	0.7	0.4	0.2	0.1	0.1	0.2
Headache	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Urinary retention	0.0	0.0	0.4	0.2	0.1	0.0	0.0	0.1
Arterial hypotension	0.3	0.1	0.3	0.1	0.1	0.1	0.1	0.1

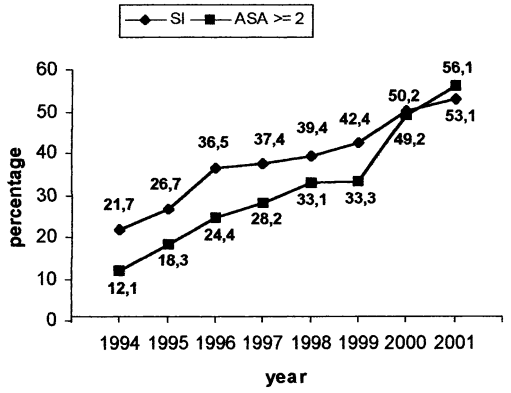

Fig. 1. Correlation between the substitution index (SI) and postoperative anaesthetic events expressed in percentage.

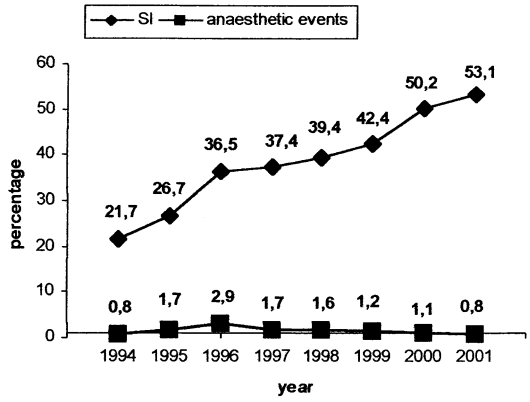

Fig. 2. Correlation between the substitution index (SI) and patient with ASA risk ≥ 2 expressed in percentage.

DSU too. We had not considered haemorrhoidectomies for DSU before 1999 (except very selected cases) because of the pain and postoperative comfort. This initial exclusion was reconsidered because of the development of new postoperative analgesic schedules and changes in surgical technique [5].

Anaesthetic, surgical, administrative and social causes of admission are classically considered in the literature [6]. The index of early and late admissions is one of the more accepted quality indicators in the DSU, but it has been studied only by a few groups of authors. Ramón et al. have published a rate of 1.4% in a series of 1310 patients, including both late and early admissions. Rivera et al. [7] reached a rate of 1.8% with a substitution index of 63.2%. A more extensive study by Fortier et al. [8] over a group of 15 172 patients had a percentage of admissions of 1.4%.

In our experience, the most frequent anaesthetic events that cause admission are nausea and vomiting, headache, pain and urinary retention. A study and knowledge of all them is essential for prevention. In our series, nausea and vomiting, and postoperative pain have a markedly high incidence. Both the inclusion of antiemetic drugs [9] and an improvement in the treatment of postoperative pain [10,11] could be a promising way to reduce the rates in the future [12].

It is important to point out that our study shows a correlation between the increase of substitution index and the rate of patients with ASA risk of 2 or more, but the incidence of anaesthetic causes of admission have remained stable.

In conclusion, in spite of the increase in surgical and anaesthetic complexity, and the overall DSU activity, the anaesthetic indicators of quality have not worsened. This has been achieved by refining anaesthetic techniques and the use of new drugs.

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