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Editorial

Foundation and early history of the international association for ambulatory surgery 1995–2001

The initiative to establish Ambulatory (Day) Surgery in the International forum can be traced to the First European Congress on Ambulatory Surgery, which was held in Brussels, 8–9 March 1991, and organised by Dr Claude de Lathouwer, President, Belgian Association of Ambulatory Surgery. This was a success with 600 delegates from 25 countries and it was decided to hold another conference in 1993.

The Second European Congress on Ambulatory Surgery was held in Brussels 19–20 March 1993, during which a group of representatives from interested nations held an informal meeting, convened by Claude de Lathouwer, to consider the formation of an international association dedicated to ambulatory surgery. The proposal attracted strong support and it was agreed that more formal meetings of the group of interested representatives should be organised.

A further meeting was held in London (UK) 17–18 September 1993 and the interested group became the Foundation Committee, which unanimously agreed that the International Association for Ambulatory Surgery should be formed. Claude de Lathouwer was elected Convenor. Member nations of the Foundation Committee were as follows: Australia, Belgium, France, Germany, Netherlands, Italy, South Africa, Spain, Sweden, Switzerland, United Kingdom and the United States of America.

It was also decided that the Association should be registered in Brussels (Belgium) and this would require preparation of a Constitution. Ambulatory Surgery, a journal dedicated to ambulatory (day) surgery practice had been commenced in 1992 with Paul Jarrett (UK) and Bernard Wetchler (USA) as editors—the first issue was launched in March 1993 during the second European Congress. It was agreed that Ambulatory Surgery would become the official journal of the Association.

The next meeting of the Foundation Committee was held in Orlando (USA) 9–10 May 1994 and this was almost entirely dedicated to drawing up the Constitution. Claude de Lathouwer agreed to prepare a draft Constitution. It was also agreed that the next conference should be held in Brussels, 14–15 March 1995 as the First International (Third European) Congress on Ambulatory Surgery.

The Foundation Committee met again on 14 March 1995 during the First International (Third European) Congress on Ambulatory Surgery and the Constitution was adopted. The following day, 15 March 1995, formation of the International Association for Ambulatory Surgery was announced at the Congress by Claude de Lathouwer, who had been elected Foundation President. A Foundation Dinner was held the same night.

The main objectives of the Association are—to serve as an international multidisciplinary forum for the exchange of information and advancement of ambulatory surgery, to promote education and research, to establish guidelines and to act as an advisory body to all interested parties for the development and maintenance of high standards of patient care in ambulatory surgery facilities.

Claude de Lathouwer offered to locate the Secretariat of the Association at his office in Brussels and this was gratefully accepted by the Executive, which was formed from the Foundation Committee. The efforts of Claude de Lathouwer in organising the Congresses, convening meetings of the Foundation Committee and preparing the Constitution of the Association, were acknowledged by the Executive. He also initiated the important project of collecting international data on ambulatory surgery practice in conjunction with the Organisation for Education and Co-operative Development (OECD). This data has been published and continues to be updated.

The Constitution provides that full membership representatives of affiliated nations form the General Assembly, which elects the Executive, and two meetings are held each year. The President and the Executive are elected for 2 year terms.

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The primary challenge for the new Association was to increase membership and to establish Ambulatory Surgery as the pre-eminent International Journal on Ambulatory Surgery practice. Paul Jarrett (UK), Bernard Wetchler (USA) and Tom Ogg (UK) have been tireless in their successful efforts in these projects.

The Second International Congress on Ambulatory Surgery was held in London (UK) 14–15 April 1997. This was a successful Congress with 1100 delegates from 36 countries. The General Assembly/Executive held meetings during the Congress and Paul Jarrett (UK) became President. He initiated the project of preparing international definitions of ambulatory (day) surgery, and co-opted Australia to assist. Membership of the Association steadily increased.

The Third International Congress on Ambulatory Surgery was held in Venice (Italy) 25–28 April 1999 and was a most successful event with 2311 delegates from 41 countries. Tom Ogg (UK) became President. His successful efforts in attracting major sponsorships for the Association significantly contributed to establishing its financial strength. He also prepared the Bid manual for nations to apply to host International Congresses. He identified quality expansion of day surgery as the main objective with increasing effort to expand membership to Asia Pacific, South America and Eastern Bloc nations. The preparation of International Definitions was protracted, however, these were finalised in October 1999 and will be published in Ambulatory Surgery with translations into 11 languages. The important project of developing an education process for ambulatory surgery was established with Italy being delegated the responsibility of preparing a Thematic Network for distant ambulatory surgery education. A Skymed Pilot Utilisation Plan was introduced in September 2000 and preparation of a course of lectures, video tapes and data will then be presented on the internet for world wide retrieval.

Financial management of the Association was delegated to France and the excellent efforts of the Treasurer, Gerard Parmentier, have been recognised by the Executive.

The Association is now well established and continues to expand. The Congresses have been very successful with increasing numbers of delegates. The Third International Congress on Ambulatory Surgery was to be held in Geneva, Switzerland 22–25 April 2001.

At the end of the year 2000, the following countries were affiliated:

Full membership—Australia, Austria, Belgium, Denmark, France, Germany, Hong Kong, Italy, Netherlands, Norway, Poland, Portugal, Spain, Switzerland, United Kingdom, United States of America.

Associate Members—Australia, Chile, Italy, Hungary, South Africa, Romania.

Individual Members—Canada, Egypt, Greece, Latvia, Ukraine.

This unique multi-disciplinary organisation will continue to work for the expansion of high quality ambulatory surgery world-wide, especially to those countries that have not yet developed this important procedural service. The achievement of its objectives largely depends on the development of excellent communication channels and to this end has formulated its own website www.iaas-med.org.

Ambulatory surgery will continue to expand and the formation of the International Association for Ambulatory Surgery will be recognised as one of the great initiatives in the achievement of its potential.

Council of Presidents,

International Association for Ambulatory Surgery,

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Spiegelian hernia: ambulatory surgical treatment

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Abstract

Purpose: Spiegelian hernias (SH) represent only 2% of abdominal hernias. Treating ten outpatient cases motivated both the presentation of our experiences and a review of diagnostic and surgical treatment procedures. Predisposing factors, clinical presentation, diagnostic methods, surgical procedure, time spent in the Unit and the postoperative course have been analysed. *Results:* a predisposing factor was observed in eight patients. In four cases patients suffered abdominal pain, non-specific discomfort occurred in three and in six a mass was observed. Ecography in four patients and a computerised scan (CT) in two cases confirmed the diagnosis. Herniorrhaphy was performed in two patients, hernioplasty with a mesh in seven cases and a double polypropylene mesh was used once. There was no morbidity and the average length of time in the Unit was 99.3 min. To date no recurrences have been reported. *Conclusion:* SH is associated with several predisposing factors. Diagnosis can be difficult due to location and non-specific symptoms. Clinical examination is essential for diagnosis, with complementary examinations such as an ecography and/or CT.

Keywords: Spigelian hernia; Surgery with no hospital admission; Ambulatory surgery; Hernia of the abdominal wall

1. Introduction

Spiegelian hernia (SH), recognised for the first time by Josef T. Klinkosh [1] in 1764, is a rare defect, representing only 2% of the abdominal wall hernias [2]. It is a pathology, which presents difficulties in preoperative diagnosis due to its location within the abdominal wall and its non-specified clinical presentation.

The term SH is derived in honour of Adrian Van Der Spiegel, an anatomist who was born in Brussels (1576–1635) and was first to recognise the semilunar line. It has further been referred to as the lateral ventral hernia or 'semilunar hernia'. The hernia occurs through the Spiegelian fascia: the anatomic region located between the Monro line (spinal and umbilical), the interespinal line, the Spiegelian line and the external edge of the rectus abdominis muscles, where the wall provides decreased resistance (Fig. 1). According to various authors [3], the anatomic weakness of the Spiegelian fascia can be explained through several theories: (A) the fibres of the internal oblique muscle and the transversus abdominis muscle interbreed at a supraumbilical level, whilst following parallel directions at an infraumbilical level. (B) At the level of the semicircular line or Douglas's line, all muscular fascia of the anterolateral abdominal wall become anterior to the rectus abdominis muscles, the aponeurosis of the tranversus abdominis muscle and the internal oblique muscle interbreed and weaken remarkably, thus creating a suitable point for the development of a hernia [4]. The fibres of the external oblique muscle keep their consistence, consequently, the hernia is often observed under the fascia of this muscle [5]. (C) The epigastric artery crosses the tranversalis fascia protruding into the fascia of the rectus abdominis muscle at the level of its external edge and the inferior edge of the Douglas line, creating a space, which could enable the development of a sliding hernia.

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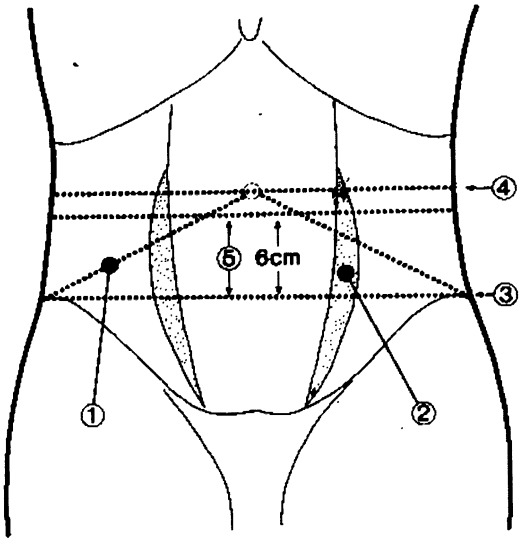

Fig. 1. (1) Monro line. (2) Spigelian Fascia. (3) Interspinal level. (4) Umbilical level. (5) Areas of the Spigelian Hernias

The aim of this article is to present the experience obtained in our Ambulatory Surgical Unit with regards to the diagnosis and the treatment of this uncommon condition.

2. Material and methodology

Over 2 years (May 1998–May 2000), 1259 hernias of the abdominal wall were diagnosed and operated on in the Ambulatory Surgical Unit of the University General Hospital, Valencia. Ten (0.79%) of these were Spiegelian hernias. The average patient age was 60.8 years (range 42–89) with an even representation of both sexes and both sides of the abdomen.

The following were analysed: predisposing factors (obesity, repeated pregnancies, constipation, chronic obstructive lung disease, ascites, previous laparotomies); the association with other hernias of the abdominal wall; clinical presentation (pain, mass, non-specific symptoms, subocclusions); diagnosis (through physical examination and complementary techniques); surgical procedure (use or non-use of mesh implants); morbidity, length of admittance to hospital and postoperative monitoring.

3. Results

In nine out of ten patients there was a predisposing or associated risk factor. Of the five male patients, three exhibited previous abdominal surgery (appendicectomy, inguinal and umbilical hernia), one showed criteria of obstructive chronic lung disease whereas no risk factors were observed in the fifth patient. The five female patients all reported previous pregnancy, four suffered abdominal pain and three experienced non-specific discomfort. A defect in the abdominal wall and the presence of a reducible mass were observed in six patients.

Ecography was performed in four cases in order to confirm the diagnosis. Abdominal CT accurately diagnosed in two cases the presence, location and contents of the hernia. In all patients, the diagnosis was preoperative. The operation was executed under local anaesthesia with 0.5% Lidocaine (100 mg), sedation (1 mg Midazolan and 2 g Magnesium Metamizol) and monitored anaesthetic care (blood-pressure, pulse oximeter and electro-cardiogram) using anaesthetics such as Propofol® and Remifentanilo® with perfusion pumps. Surgery was approached through the pararectal tract, which constituted in the opening of the fascia of the external oblique muscle. Reduction of hernia contents and ordinary herniorrhaphy were required on two occasions, a polypropylene mesh was placed in seven cases and a double mesh (preperitoneal and supraponeurotic) was employed in one case.

Patients were discharged from hospital on the same day with no postoperative complications, with an average stay in the Unit of 99.3 min. There was no morbidity or mortality. No recurrences have arisen to date.

4. Discussion

SH predominantly affects patients in the fifth decade of their life onwards, with the same frequency in both sexes, equal distribution on both sides of the abdomen. Exceptionally SH may be bilateral [6].

Clinical presentation is variable and may be non-specific. The most frequent symptoms are abdominal pain and/or a palpable anterior abdominal wall mass. Complications such as intestinal subocclusion [7,8], incarceration [9] and strangulation [10] may be the initial presentation.

The diagnosis of these hernias can be difficult due to their location (under the fascia of the external oblique muscle) and due to their non-specific symptomatology, especially in obese patients.

Differential diagnoses include lipomata, bruises, rectus myotendinitis, neoplasias of the abdominal wall, abscesses, acute appendicitis and diverticulitis. If the hernia is of reasonable size and normal contents a plain X-ray will show a gaseous image [11] through intestinal entrapment.

Ecography reveals the fascial defect near the semilunar line or the presence of a moveable mass under the external oblique muscle [11]. CT provides a more accurate representation than an ultrasound scan, thus remaining the first choice since it enables observation of the defect in the fascia and identification of the sac and its contents [12].

Treatment is always by surgery in order to avoid complications. If the hernia is not palpable, an approach through a paramedian incision with preperitoneal dissection is highly recommended [13]. However, if it is palpable a cutaneous incision over the hernia is preferable, opening the fascia of the external oblique muscle following the direction of the fibres, dissection and treatment of the hernia sac, and finally, closing the fascial defect. Results following ordinary closure are satisfactory and the use of a reinforced mesh implant is reserved for wide hernia orifices, relapses or parietal debilities [14]. Another technique that has been used for repair is the positioning of a preperitoneal plug [15]. Over recent years, a few cases of laparoscopic repair, with or without implant material, have been reported [16]. SH repair has a low morbidity and recurrences are infrequent [7–13].

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Ketamine for co-induction of anaesthesia in oral surgery

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Abstract

Ketamine has additive interaction with propofol and analgesic properties. The aim was to determine if ketamine co-induction reduced propofol induction doses, improved pain relief and produced any adverse effects. Forty ASA I and II patients scheduled for extraction of third molars were enrolled in a randomised, double blind study. Group ketamine patients ($n = 20$) received ketamine 0.3 mg/kg prior to induction with propofol running at 300 ml/h. Group control patients ($n = 20$) received a corresponding volume of normal saline. All patients were intubated and maintained on N_2O:O_2 admixture and isoflurane. Post-operatively, patients were given i.v. fentanyl boluses, oral Panadeine Forte or Oxycodone as rescue medication for pain. Data collected consisted of propofol induction doses, blood pressure and heart rate readings at 1 min intervals, visual analogue score (VAS) pain scores at various intervals and fentanyl requirements in recovery. Duration of surgery and time to discharge were also recorded. Possible side effects of nausea, dreams and hallucinations were noted. There was no significant difference in propofol induction doses, pain requirements and pain scores between the two groups. However, there was significant increase in the blood pressure ($P < 0.006$) and heart rate ($P < 0.009$) at induction. The discharge time in the ketamine group was not prolonged and no adverse side-effects like bad dreams or emergence delirium were noted. We conclude that low-dose ketamine at 0.3 mg/kg does not reduce the induction dose of propofol or improve the post-operative pain of oral surgery. However, this dose does not affect recovery or produce unpleasant side-effects, making it a possibility for use in day surgery.

Keywords: Co-induction; Ketamine; Additive interaction; Analgesia

1. Introduction

Co-induction of anaesthesia has been receiving wider acceptance recently as it offers advantages of improved effect profile, a more balanced ratio of desired versus adverse effects, simpler treatment requirements and lower costs [1]. Hitherto, the combination of midazolam and propofol has been most popular as the synergism between the two has reduced required doses of propofol by up to 40% [2].

Ketamine is an intravenous anaesthetic that has shown additive interaction with propofol when used for induction in female patients [3]. Furthermore, low dose ketamine has been shown to reduce post-operative pain [4] and by blocking *N*-methyl-D-aspartate (NMDA) receptors, may even possess a pre-emptive effect [5]. In the day surgery setting, co-induction with midazolam has not affected discharge times. However, ketamine has not been widely used as a co-induction agent as there have been concerns of delayed discharge and visual disturbances with confusion [6]. It was the aim of this study to determine if co-induction with ketamine in the day-surgery setting reduced propofol induction requirements, improved post-operative pain relief and affected recovery profiles of patients.

2. Methods

The study was approved by the Hospital Ethics Committee and all patients gave written informed consent to participate in a randomised, double-blinded study. Forty ASA I and II patients aged 17–50-years old admitted for extraction of wisdom teeth were ran-

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Table 1
Scoring for surgical difficulty of third molar extractions

Score	Description
(*A*) *Pre-surgical assessment*	
1	Periodontally involved with weak bone attachment
2	Vertical unimpacted (exposed)
3	Vertical soft tissue impactation
4	Mesioangular superficial
5	Mesioangular deep or distoangular superficial
6	Distoangular deep or horizontal superficial
7	Horizontal deep
(*B*) *Post-surgical assessment*	
a	Unfavourable root formation
b	Nerve involvement
c	Surgical access
d	Operative success including time taken

Pre-surgical assessment score (1–7) is strictly applied and then (i) left unchanged, (ii) increased by 1–3 or (iii) decreased by 1–3 according to a post-surgical assessment that includes a–d.

domly allocated into two groups by drawing encoded cards from an envelope. Patients received either a ketamine bolus of 0.3 mg/kg diluted in 10 mg/ml dilution (group ketamine) or a corresponding volume of normal saline (group control) prior to induction. The drawing of the cards and administration of the pre-induction drug was performed by a member of the team not involved in the anaesthetic.

A 22 gauge cannula was inserted in a suitable vein in the arm and baseline measurements of non-invasive blood pressure, arterial oxygen saturation (SaO_2) and heart rate were made. The patient was pre-oxygenated with oxygen 4 l/min by face-mask. After the initial injection of ketamine or normal saline, fentanyl at 1.5 μg/kg was injected 60 s later, followed by iv lignocaine 20 mg. After 20 s, anaesthesia was induced with a 1% propofol infusion running at 300 ml/h using a Graseby 3200 pump. The end-point of induction was reached when the anaesthetist lost verbal contact with the patient and there was no response to eyelash reflex, both of which were repeated in 5 s intervals. Thereafter, an appropriate dose of vecuronium was given and the patient was bagged on 4 l N_2O:2 l O_2 admixture with isoflurane at an end-tidal concentration of 1% for 2 min before nasal intubation. All patients were given local infiltration of lignocaine 2% with adrenaline 1:80 000 before surgery commenced.

The hemodynamic measurements were taken at 1 min intervals from administration of ketamine or normal saline till 5 min thereafter. The time to reach the end-point and the dose of propofol required were noted. The duration of surgery, degree of surgical difficulty and number of wisdom teeth extracted were recorded. The degree of surgical difficulty was scored by the surgeon performing the surgery based on a scoring system used by Rudkin et al. [7] (Table 1).

In the recovery, besides blood pressure, heart rate and SaO_2 measurements, time to discharge from phase II recovery were also recorded. Pain scores were taken by recovery staff who were blinded to the anaesthetic technique. We used a visual analogue score (VAS) with 0, no pain; and 10, worst pain ever which were taken at various intervals in the recovery. These were namely on arrival, 1 h after admission and upon discharge from the recovery ward. Rescue medication was given in the form of i.v. fentanyl boluses of 25 μg, oral Panadeine Forte 1 g and Oxycodone 10 mg. Vomiting requiring anti-emetic treatment with maxolon was also noted.

The next day, all patients were interviewed by telephone during which the analgesic requirements, possible post-operative effects of drowsiness, vomiting, hallucination, vivid dreaming or nightmares were asked. Global satisfaction was scored by patients at this time using a verbal rating scale (0, not satisfied; 1, neutral; 2, satisfied; 3, very satisfied).

Nominal data was analysed using student's *t*-test and non-parametric data was analysed using Mann–Whitney test. The χ^2-test was used to compare the number of patients requiring analgesics, anti-emetics and the incidence of dreaming and post-operative vomiting after discharge. Data are presented as mean ± S.D. $P < 0.05$ indicated a statistically significant difference between groups.

3. Results

Forty patients, 20 in each group were enrolled into the study. The two groups were comparable with respect to demographics, duration of surgery (Table 2) and in degree of difficulty of surgery (Fig. 1). The induction doses of propofol in total and per kg body weight were not significantly different (Table 2).

Although the number of patients requiring fentanyl rescue in the control group was almost twice the num-

Table 2
Demographics, duration of surgery and propofol induction doses of patients receiving ketamine or normal saline (control) prior to induction

Group	Age (years)	Weight (kg)	Duration of surgery (min)	Propofol dose (mg)	Propofol (mg/kg)
Ketamine ($n = 20$)	24.1 ± 5.3	68.4 ± 15.3	25.4 ± 13.9	95.2 ± 33.9	1.42 ± 0.47
Control ($n = 20$)	24.1 ± 6.6	68.1 ± 16.6	26.1 ± 14.9	111.5 ± 31.5	1.68 ± 0.49

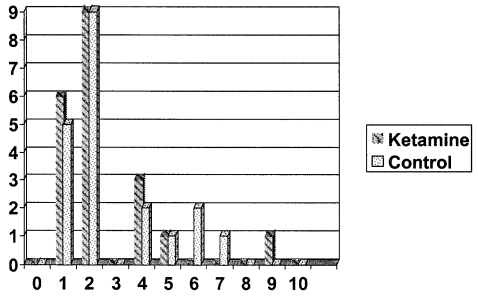

Fig. 1. Distribution of surgical difficulty by scoring.

ber in the ketamine group (nine vs. five, respectively), this was found to be not significant. Likewise, the mean dose of fentanyl given in the two groups was not significantly different (60 ± 37.9 vs. 86.1 ± 89.3 μg).

The time to first request for fentanyl was significantly longer in the ketamine group as compared with the control group (Table 3). When comparing pain scores, there were no significant differences in the pain scores between the groups taken on first admission, at 1 h and upon discharge from the recovery (Table 4).

Blood pressure and heart rate variables taken 2 min before induction and 5 min after induction did not show significant differences except for the readings at induction which corresponds to 2 min after the study drug was given (Tables 5 and 6). The blood pressure ($P < 0.006$) and heart rate ($P < 0.009$) values at this juncture were significantly higher in the ketamine group.

Discharge times of patients from phase II recovery and the number of patients requiring anti-emetics in recovery were not significantly different (Table 7).

The number of patients requiring Panadeine Forte 1 g and Oxycodone 10 mg in the recovery were as follows, 13 and 4, respectively, for ketamine group, 12 and 3, respectively, for the control group. Fifteen patients in the ketamine group required Panadeine Forte 1 g 4 h on the first post-operative day as compared with 16 patients in the control group. The number of patients who reported dreaming post-operatively were similar in both groups. Verbal satisfaction scores were not significantly different (Tables 7 and 8).

Table 5
Changes in MAP between the ketamine and control group over 7 min after test drug administered

Time at record of MAP	Ketamine group (mmHg)	Control group (mmHg)
On injection of ketamine/saline (0 min)	94.9 ± 9.4	94.9 ± 10.7
After 1 min	93.9 ± 9.4	92.8 ± 8.8
After 2 min	98.6 ± 10.8[a]	89.2 ± 9.5
After 3 min	97.0 ± 13.1	91.9 ± 15.9
After 4 min	96.3 ± 15.8	90.9 ± 11.9
After 5 min	94.3 ± 13.1	90.7 ± 19.1
After 6 min	95.5 ± 15.2	89.2 ± 19.1

[a] Significant group difference with $P < 0.05$.

Table 6
Changes in heart rate between the ketamine and control group over 7 min after test drug administered

Time at record of heart rate	Ketamine group (beats per min)	Control group (beats per min)
On injection of ketamine or saline (0 min)	79.5 ± 11.6	75.6 ± 13.8
After 1 min	81.4 ± 17.6	74.3 ± 15.6
After 2min	84.1 ± 18.1[a]	70.4 ± 12.6
After 3 min	83.8 ± 16.2	70.2 ± 13.1
After 4 min	81.6 ± 16.6	74.5 ± 10.9
After 5 min	80.5 ± 13.8	76.6 ± 16.3
After 6 min	82.5 ± 14.7	77.7 ± 15.5

[a] Significant group difference with $P < 0.05$.

4. Discussion

Propofol and ketamine have been shown to have an additive effect even though their mode of action is

Table 3
Number of patients requesting fentanyl, time to first request for fentanyl and mean doses of fentanyl for ketamine group and control group

Group	Number of patients requesting fentanyl	Time to first request (min)	Mean fentanyl dose (μg)
Ketamine	5/20	42.8 ± 46.9[a]	60 ± 37.9
Control	9/20	27.9 ± 14.6	86.1 ± 89.3

[a] Significant group difference with $P < 0.05$.

Table 4
Pain scores on arrival to recovery, 1 h after arrival and upon discharge from recovery for ketamine group and control group

Group	Pain score on arrival	Pain score 1 h after	Pain score on discharge
Ketamine	1.23 ± 3.45	2.63 ± 2.63	2.1 ± 2.05
Control	1.42 ± 3.63	2.35 ± 1.63	3.1 ± 2.19

mediated by different receptors [3]. In the study by Hui et al., the ED_{50}s to achieve hypnotic end-point as denoted by failure to open the eyes on verbal command were 0.97 mg/kg propofol and 0.33 mg/kg ketamine. Sakai et al. [8] showed similar additive interaction between the two for achieving hypnotic endpoints, however, only ketamine bolus more than 0.5 mg/kg iv followed by an adjunctive ketamine infusion, resulted in reduction of propofol doses for achieving hypnosis. In our study, we found that ketamine 0.3 mg/kg given at induction did not reduce the induction doses of propofol significantly. This could be due to two reasons. Unlike the previous two studies where the patients were mainly Asian in origin, our patient population comprised mainly of Caucasians and by nature of the surgery that was performed, our patients were young and likely to be anxious. Baseline anxiety has been shown to increase anaesthetic requirements [9] and Kindler et al. have demonstrated a high degree of anxiety in young patients [10]. Thus the study dose of ketamine although effective in the previous study [3] for co-induction, may not have been sufficient for our study population to cause an appreciable difference in propofol induction doses. Secondly, the patients who received ketamine showed a significantly higher blood pressure and heart rate compared with the control group. This would result in a reciprocal increase in the cardiac index which has been demonstrated with ketamine before [11,12]. Cardiac output on brain concentration of propofol has been demonstrated in the sheep model and this has been found to be inversely proportional [13]. We postulate that with this increase in cardiac output by ketamine, the distribution of propofol to the brain is reduced and although previous studies have shown additive effect between the two drugs, this effect of ketamine on propofol brain concentration may cancel out its effectiveness as a co-induction agent.

Previous studies have shown low dose ketamine to reduce post-operative pain [5,14,15] and Suzuki et al. [16] had even showed the analgesic effect of ketamine to last for three to five plasma half-lives of ketamine. Our study failed to demonstrate a reduced need for analgesia in the form of intravenous fentanyl, oral Panadeine Forte or Oxycodone in the immediate post-operative period up to discharge time in the ketamine group. Although the time to first request for fentanyl was longer in the ketamine group as compared with the control group ($P < 0.05$), this beneficial effect was not delayed sufficiently to reduce overall analgesic demands while in the recovery.

This lack of difference in analgesic needs between the two groups could be due to the local infiltration of lignocaine at the start of the surgery which would have masked the subtle effect of ketamine on analgesia as evidenced by the mean fentanyl requirements in phase I recovery.

We had deliberately chosen not to omit the local anaesthetic as it was intended to assess if ketamine further augmented the standard pain relief methods that were in use.

Since none of the patients received ketamine after the surgical procedure coupled with iv fentanyl and local infiltration prior to incision, we are unable to comment on the efficacy of pre-emptive administration of ketamine. Some previous studies [4,5,16] have shown the analgesic effect of low-dose ketamine to be long-lasting and may even decrease analgesic requirements for up to 2 days post-operatively, far outlasting the duration of action of ketamine. In our study, we were unable to demonstrate this reduction in Panadeine Forte requirements in the ketamine group on the first post-operative day, by which time the local anaesthetic had worn off. Ketamine is said to mediate analgesia via various mechanisms of which one is the synergistic or additive interaction among opioids, which elicits activation of the NMDA receptors [17] and NMDA antagonists. Unlike the previous studies which used morphine for post-operative analgesia, our patients were given Panadeine Forte and this interaction was not evident.

Table 7
Discharge time, number of patients requesting anti-emetics and pain relief in ketamine group and control group

Group	Discharge time (min)	Number of patients given anti-emetic	Number of patients given Panadeine Forte 1 g	Number of patients given Oxycodone 10 mg
Ketamine	121.8 ± 26.8	1/20	13/20	4/20
Control	143.6 ± 56.8	1/20	12/20	3/20

Table 8
Number of patients with Panadeine Forte 4 h requirements, vomiting, dreaming and verbal satisfaction scores

Group	Number of patients needing Panadeine Forte 1 g 4 h	Number of patients with dreaming	Number of patients with post-operative vomiting	Satisfaction score
Ketamine	15/20	4/20	7/20	1.38 ± 0.7
Control	16/20	4/20	7/20	1.65 ± 0.49

The discharge times were not prolonged in the ketamine group. This may reflect the minimal effect of recovery problems such as drowsiness, nausea and vomiting which are the main factors which delay discharge after day surgery [18]. A bolus of (*S*)-ketamine 50–200 μg/kg has been shown to produce drowsiness resembling that of ethanol ingestion [19] and in the study by Suzuki et al., patients receiving ketamine 100 μg/kg and morphine had higher drowsiness scores which affected the duration of phase I recovery. We had not scored the level of drowsiness in our patients as our aim was to determine if the overall discharge time from the day surgery unit was affected by ketamine, which was felt to be of more clinical significance.

Ketamine has been said to increase nausea and vomiting. In a study by Badrinth et al. [20] where ketamine was used in combination with propofol for monitored anaesthetic care, there was a dose-dependent rise in the incidence of nausea and vomiting in the groups receiving ketamine. Our patients did not show a difference in the need for anti-emetics or post-operative vomiting after discharge and this was probably related to the low dose of ketamine used.

Ketamine at doses of 100–500 μg/kg have produced dose-related impairment of sensory perception and altered mood states [21,22] whilst higher doses at 1–3 mg/kg are associated with unpleasant dreams and acute psychosis-like symptoms on emergence [23]. In our study, we could not detect a significant difference in the incidence of post-operative dreaming although one patient in the ketamine group complained of frightening nightmares whilst in the recovery. A study by Hejja and Galloon found that patients who dreamed after ketamine were those who normally dreamed at home [24] and this is a point to bear in mind before administering ketamine.

Our findings show that low dose ketamine, although unsatisfactory as a co-induction agent in reducing the induction dose of propofol has no adverse effect on the patient, even in the day surgery setting. It does not enhance non-opioid analgesia and in the day surgery where analgesics other than opioids are preferably used, ketamine does not appear to offer an advantage of enhancing pain relief. At this dose, ketamine can be used in the day surgery without ill effects. In order to enjoy the effects of reduction of propofol dosage and analgesia, future studies may need to employ higher doses of ketamine for induction. However, one will have to consider the possibility of increased incidence of nausea, vomiting and drowsiness which may affect discharge after day surgery.

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Ventricular tachycardia in patients subjected to extracorporeal lithotripsy

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Abstract

Five consecutive patients diagnosed with right renal lithiases, developed ventricular tachycardia during a non-synchronized extracorporeal wave lithotripsy, using an electromagnetic lithotriptor. Although no patient had a past history of cardiac problems, ventricular extrasystoles were noticed at 300–500 wave impulses and the patients developed ventricular tachycardia at 2500–3000 impulses. The arrhythmia ended spontaneously when the lithotripsy was discontinued. Following replacement of the generator and head of the lithotriptor, dysrhythmias of this nature were no longer a problem in 1200 subsequent patients. The possibility of interference between the shock wave and normal myocardial rhythm makes it essential to maintain proper upkeep of the lithotriptor.

Keywords: Sedation; Ventricular tachycardia; Lithotripsy

1. Introduction

Extracorporeal shock wave lithotripsy (ESWL) is a safe technique for the treatment of urinary tract lithiasis. A radical change took place in the treatment of renal and ureteral lithiasis during the 1980s. The appearance of ESWL, whether associated with endourology or not, is the method of choice for the treatment of urinary lithiasis. Open surgery has been relegated to a marginal position in the treatment of lithiasis (nephrectomy for large calculi that result in a non-functioning kidney, correction of anatomic anomalies, large coraliform calculi, etc....), which are 1–2% of lithiases [1].

Complications may appear, however, while ESWL is being carried out. Although not significant in number, they include: hemorrhage, sepsis, cardiac arrhythmias and 'steinstrasse' (fragmented calculi that locate in the lower ureter and produce obstruction).

2. Clinical case studies

We present five patients who developed ventricular tachycardia during extracorporeal lithotripsy treatment with Siemens Lithostar Multiline. Standard preoperative evaluation included biochemistry, blood count and coagulation studies, chest X-ray and electrocardiogram (EKG), as well as discontinuation of anticoagulant or even platelet antiaggregatory drugs 1 week prior to procedure. Monitoring included EKG, pulse oximetry (SpO_2) and periodic checking of blood pressure during treatment. According to the protocol established at our hospital, analgesia was provided by a remifentanil continuous perfusion, 0.05 μg/kg per min ($n = 2$) or alfentanil at 20 μg/kg in bolus, followed 15–20 min later by another 8 μg/kg bolus ($n = 3$).

Five consecutive patients presented for right sided lithiasis (four with lower and one with an upper tract stone). None of the patients had a past history of heart disease. During the procedure isolated ventricular extrasystoles were observed in each of the five patients at 300–500 shock wave pulses (at 4 units of power); ventricular tachycardia developed (heart rate of 120 beats per min) that coincided with shock wave frequency. On discontinuing ESWL, arrhythmias ceased.

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Further procedures were suspended to permit checking by the lithotriptor engineers. They found no fault whatsoever. At the insistence of the Anesthesiology and Resuscitation Department, which felt that there had to be a technical fault that was causing the arrhythmias, the generator, which had performed 6 million discharges (average life is 4 million), and the head, which has a mean life of 1 million discharges (2 million performed) were replaced. Once the replacement had been carried out, no rhythm disturbances took place again after the above-mentioned episodes.

3. Discussion

In 1966 an engineer from the Dornier company, by chance, discovered shock wave transmission when he experienced a type of electrical shock upon the impact of a projectile on a card with which he was in contact. The first report on the effects of shock waves was in the sixties and referred to tiny cracks in the structure of aircraft after impacting suddenly with drops of water and micrometeorites suspended in the atmosphere. The reaction is due to the release of energy when a high intensity force is generated at the interface between two media of different mechanical wave conduction capabilities. The waves are transmitted in a similar way in water and in human tissue (70% water), releasing part of their energy on reaching the interface with the surface of a stone [1]. The first publications on the use of this energy in the in vitro treatment of lithiasis appeared in 1971. Between 1974 and 1978 Chaussy conducted both in vitro and in vivo studies. The first experimental treatment on humans was carried out in 1980 [1].

Wave generation and focalization systems can be differentiated into two groups: (1) point source (electrohydraulic, LASER and microexpulsive); (2) wide source (electromagnetic and piezoelectric). In electrohydraulic systems both the patient and the wave generating electrode are immersed in the same bath filled with treated water. Shock waves, coordinated with the electrocardiogram, must originate during the refractory phase of the cardiac cycle, thereby avoiding myocardial stimulation and the generation of arrhythmias. This system continues to be a model in use at many hospitals [2].

Second generation lithotriptors are electromagnetic. The shock wave is transmitted to the patient via a silicone coupling diaphragm. Efficiency is enhanced by synchronizing discharges with respiratory movements. The technique requires a small focal point and constant precise locating; the wave enters the patient by way of a relatively large surface area. Patients need analgesia and/or surface sedation. At the present time, it is the form of energy used by most of the machines on the market.

Some studies have shown that cardiac arrhythmias are induced or exacerbated in 20–59% of patients by the use of piezoelectric and electrohydraulic lithotriptors. Arrhythmias occur in 1.4–9% of patients when electromagnetic lithotriptors are used without shock wave synchronization [5–8]. The dysrhythmias most commonly appearing are ventricular and atrial extrasystoles and bradycardia. These have been of no clinical significance.

There are various theories that attempt to explain the appearance of arrhythmias: (1) pre-existence of undiagnosed arrhythmias detected by continuous monitoring during lithotripsy [3]; (2) pain, anxiety or stimulation of the sympathetic system [3,4,6]; (3) vagal stimulation, giving rise to sinus bradycardia [3]; (4) positioning with decrease in venous return, or direct action of shock waves on the myocardium [4]; (5) pharmacological effects associated with sedation [3].

Zaneti et al. [9], when an electromagnetic lithotriptor was used in patients who had not previously presented with arrhythmias, reported an 8.8% incidence of arrhythmia episodes with 5.6% being ventricular arrhythmias, but in no instance were they of clinical significance. The authors found no significant correlation between the appearance of an arrhythmia, the site treated, the number and strength of the shock waves or the administration of analgesics, but they did observe that arrhthymias occurred almost entirely in patients with kidney stones. Other authors have noted that cardiac extrasystoles may be caused by the direct affect of shock waves on the heart, especially during right kidney lithiasis therapy [6,10].

With piezoelectric lithotriptors, the arrhthymias most frequently detected were supraventricular, ventricular and atrial extrasystoles and bradycardia; one 13.5″ cardiorespiratory arrest was observed [3]. In other studies [11], patients with previous cardiac disorders developed heart rates that were significantly faster prior to and following ESWL and also showed an increase of ventricular premature complexes. Billote et al. [12]. reported the appearance of supraventricular tachycardia during ESWL when using an electrohydraulic lithotriptor. They concluded that direct stimulation of the atrium with shock waves during an R wave was the causal mechanism.

Ounnoughene et al. [13], using Holter monitoring during treatment, evaluated the arrhythmogenic effects of desychronized shock waves of the latest generation lithotriptors. In the synchronous mode no patient developed arrhythmias; in the desynchronized mode atrial and ventricular extrasystoles and an unsustained ventricular tachycardia were observed. These arrhythmias were asymptomatic and ceased spontaneously. The authors concluded, even though desynchronized procedures are arrhythmogenic, the risk with the latest lithotriptors may be acceptable if prior to the procedure

a cardiology examination is performed in an attempt to identify high-risk patients, and during the procedure these patients are monitored by an anesthesiologist.

Ventricular tachycardia occuring in our series of five patients was asymptomatic and disappeared when the procedure was discontinued. All patients were being treated for right renal calculi, the condition most frequently associated with the appearance of arrhythmias. We have found no publication describing this complication when using electromagnetic lithotriptors, although, as previously mentioned, this has been described for piezoelectric and electrohydraulic systems. Continuous monitoring of cardiac treatment is therefore advisable during treatment to permit early detection of cardiac disturbances, especially in patients with already diagnosed arrhythmias or severe heart disease. In patients with known arrhythmias, the option of EKG synchronization with the refractory phase of the cardiac cycle, although seldom used, may, in some cases, allow for a successful completion of the lithotripsy procedure.

In our institution, following replacement of the generator and head, no further episodes of ventricular tachycardia have occurred in approximately 1200 subsequent procedures. We conclude that these parts, used beyond manufacturer's recommendations, may have caused interference between the shock wave and myocardial fibre, with resultant arrhythmias.

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Undergraduate teaching in an oral surgery day case unit

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Abstract

Objective: To examine the immediate post-operative morbidity experienced by patients following dento-alveolar procedures on a day-case basis when student operators are involved. *Design:* Single centre prospective study. *Setting:* Oral Surgery Day Case Unit. *Subjects:* One hundred and six patients underwent surgical removal of third molar teeth. Under supervision of an experienced operator, 55 undergraduate dental students removed a unilateral lower-third molar tooth and the contra lateral third molar teeth were excised by the experienced operator (student/staff operators). A comparative group of 51 patients were operated on entirely by experienced operators. There was no significant difference between the levels of tooth eruption and types of impacted teeth removed in either group. *Results:* The median operating time for the student/staff operator group was 30.0 (range 10–60) min, compared with 20.0 (range 5–55) min for experienced operators. Four patients experienced post-operative nausea and vomiting in the student/staff operator group compared with one in the experienced operator group. Post-operative analgesia was requested in the student/staff operator group at 23.0 (range 0–100) min and in the experienced operator group, 30.0 (range 0–80) min. Seventy-eight percent of patients in the student/staff operator group suffered moderate/severe pain immediately after surgery compared with 59% of patients treated by experienced operators. Six patients in the student/staff operator group suffered temporary lingual nerve anaesthesia, which resolved within 2 weeks after surgery compared with none in the experienced operator group. *Conclusions:* The concept of monitoring clinical outcomes in relation to under-graduate teaching is important. In the immediate post-operative period, student operators increase post-operative morbidity experienced by patients undergoing oral surgical procedures. Four patients in the student operator group suffered greater post-operative morbidity compared with one in the experienced operator group. In the day case setting, with careful case selection of patients, an environment can be created where patient throughput can be valuable for one-to-one teaching.

Keywords: Undergraduate; Teaching; Oral surgery; Day surgery

1. Introduction

A considerable number of patients who require minor oral surgery are referred for treatment under general anaesthesia on an ambulatory basis. The majority of these patients, however, are managed under local anaesthesia supplemented with sedation. Greenwood et al. reported that a significant number of oral surgical procedures involving routine dento-alveolar surgery were still undertaken on a day case basis [1]. Day surgery is recognised as an area for expansion and development by the Royal College of Surgeons and the Audit Commission [2,3] and the educational benefits of a Day Unit include the provision of a steady flow of case material, which provides not only a repetitive and concentrated opportunity to demonstrate surgical techniques, but also a place where hands-on experience can be gained rapidly.

This study was undertaken to examine whether immediate post-operative morbidity was altered when student operators were given surgical teaching on patients undergoing day case surgery (student/staff operators). To compare adverse outcomes following third molar excision, a similar comparative group of patients were treated entirely by staff (experienced operators). Day surgery units are unique in that patient assessment and diagnosis along with surgical procedure and recovery can be taught on the same day. Not only is there an

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emphasis on clinical skills training, but other key aspects of day surgery such as, selection of patients, anaesthesia and analgesia are emphasised utilising a multi-disciplinary teaching team. For patients who require treatment in a hospital setting, dental schools like medical schools are having to adapt their teaching in response to the reduction in inpatient availability and the increase in outpatient and community care [4]. Medical education needs to adapt to these changing patterns of health-care delivery [5,6], and day surgery centres can be used successfully to teach medical and dental undergraduates.

2. Aims of study

1. To assess how long an operation lasted when students were involved in operating on patients who required dento-alveolar procedures on a day-case basis.
2. To assess the immediate post-operative morbidity experienced by patients who had their operations performed by student/staff operators compared with experienced operators.

3. Method

Prior to the students performing their first surgical operation on a patient, experience was gained on a pig's head and suturing techniques were practised on commercially available suture aids. Under one-to-one supervision, 55 second-year clinical students undertook surgical removal of third molar teeth for the first time on patients under general anaesthesia in a day case setting. Peri-operative analgesia was provided by a single bolus dose of fentanyl 1μg/kg. Local anaesthesia was not administered at the operation sites pre or post-operatively, so that a verbal rating pain-scale could be utilised and lower lip or tongue anaesthesia/paraesthesia could be assessed. The experienced staff operators first surgically removed one impacted mandibular third molar tooth demonstrating each stage and then each student removed the contra-lateral third molar. There was no significant difference between the levels of tooth eruption and types of impaction of the teeth removed by each group. The length of operating time was measured from the time the surgical incision was made to when the last suture was placed. Following each patient's recovery, post-operative morbidity in terms of the incidence of pain, nausea and vomiting were recorded. The time from completion of surgery to request for analgesia was taken as the first indicator of pain. Patients graded their response to pain immediately after surgery utilising a verbal rating scale, as follows.

Surgical procedure	Student/Staff Operators	Experienced Operators
2 lower third molar teeth	30	33
2 lower and 1 upper third molar teeth	25	18
Total	55	51

Fig. 1. Type of surgical procedures performed in each operator group.

1. No pain;
2. mild pain;
3. moderate pain; and
4. severe pain.

Nausea and vomiting scores were also recorded verbally as yes or no immediately after surgery. At the time of discharge, the pain, nausea and vomiting scores were noted for all patients and the length of stay in the Unit also recorded.

A second group of patients were operated on entirely by experienced operators and similar assessments of post-operative morbidity were recorded. Prior to discharge, patients were asked if they had lower lip or lingual nerve anaesthesia/paraesthesia.

4. Results

Thirty-nine females and 16 males (mean age 24.4, S.D. 5.8) were operated on by students and 34 females and 17 males (mean age 24, S.D. 4.6) were operated on by experienced operators. Fig. 1 shows the types of surgery performed by student/staff and experienced operators.

The median operation time when student/staff operators were involved was 30.0 (range 10–60) min compared with 20.0 (range 5–55) min for experienced operators. Fig. 2 shows the pain scores immediately following recovery. Seventy-eight percent of patients in the student/staff operator group suffered moderate/severe pain immediately after surgery compared with 59% of patients treated by experienced operators. Post-operative analgesia was requested in the student/staff operator group at 23.0 (range 0–100) min and in the experienced operator group 30.0 (range 0–80) min.

Patients remained in the Unit for up to 120.0 (range 85–320) min in the student/staff operator group compared with 110.0 (range 80–150) min in the experienced

	No Pain	Mild Pain	Moderate Pain	Severe Pain
Student/Staff Operators	1	11	28	15
Experienced Operators	1	20	23	7

Fig. 2. Pain scores immediately after surgery.

operator group. Four patients in the student/staff operator group had post-operative nausea and vomiting. In comparison only one patient who was operated on in the experienced operator group suffered this (operating time 42 min). One of the patient's in the student/staff operator group required overnight admission as her symptoms of post-operative nausea and vomiting continued (mean operating time 50 min). Another patient in the student/staff operator group had an adverse reaction to an anaesthetic induction agent, propofol, and was detained in the Unit for 6 h post-operatively for observation, but was then allowed home. At discharge, all patients were pain-free and did not suffer with post-operative nausea and vomiting except for the one patient who was admitted as she continued to feel nauseous.

Prior to discharge, all the patients were asked if they had lower-lip or tongue anaesthesia/paraesthesia. Six patients in the student/staff operator group suffered temporary lingual nerve anaesthesia compared with none in the experienced operator group. At review, 2 weeks post-operatively, lingual nerve anaesthesia/paraesthesia had resolved completely in all six patients.

5. Discussion

Early exposure to the 'live' surgical setting can be an effective method of under-graduate teaching. This study demonstrated that students can gain valuable experience in oral surgical procedures on a one-to-one basis in a day case setting, but can contribute to an increase in immediate post-operative morbidity. Although the majority of patients requiring surgical excision of third molar teeth would be treated with local anaesthesia or local anaesthesia supplemented with sedation, teaching surgery under general anaesthesia is a conducive environment for undergraduate students with no previous surgical experience. This study was undertaken to examine the post-operative morbidity experienced by patients operated on by students. A similar comparative group of patients were treated entirely by experienced operators. The student/staff operator group is disadvantaged as the students lack surgical experience. To examine the objectives stated, the morbidity experienced by patients in the experienced operator group provided a comparison to when students were involved in the operation.

The operation time and post-operative morbidity was increased when student/staff operators were involved. This finding is not consistent with a study of 31 final year medical students at a major Australian teaching hospital. The students were reported to have no significant effect on operating time and the staff did not think they detracted from overall efficiency [7]. The students in this particular study were only assisting the surgeon in the operation theatre and not performing the surgery. The authors felt that students may enhance actively the quality of patient care.

Student/staff operations were of a longer duration and patients remained in the day unit for up to two and half hours (excluding the single patient who was detained for 6 h) whereas in the experienced operator group, patients were discharged within one and half hours post-operatively. The three most common medical causes of discharge of over 50 min are pain, drowsiness, nausea and vomiting [8]. Four patients in the student/staff operator group remained in the unit due to post-operative nausea and vomiting compared with only one patient in the experienced operator group. The time at which post-operative analgesia was requested was comparable in both groups of patients. The extended time in recovery due to post-operative nausea and vomiting may reduce the number of other patients that may be treated [9]. Another possible disadvantage of teaching students in a day unit is that the rapid turnover of patients limits student contact, and the potential slowing effect of teaching on the clinical workload could have an impact on contractual commitments [4]. During this module of surgical teaching, the throughput of patients on a list was reduced in order to accommodate teaching.

The day surgery unit is an appropriate setting for surgical teaching for dental students. The increased use of day surgery units for teaching is one way in which hospitals and medical schools could address students' needs for a more modern and relevant curriculum [10]. Day case surgery is now considered to be the best option for 50% of all patients undergoing elective surgery [2] and reflects current and future health care practice. The next generation of doctors and dentists must be trained to manage most patients on a day case basis and their education in such management must begin during their undergraduate course.

6. Conclusion

Four patients out of 55 in the student/staff operator group suffered immediate post-operative morbidity compared with one out of 51 patients in the staff operator group. Student operators do affect the immediate post-operative morbidity suffered by patients undergoing routine dento-alveolar surgery in a day case setting, however, day case operating lists provide an ideal environment for teaching/learning.

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The impact on orthopaedic workload of the introduction of a dedicated day surgery unit

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Keywords: Orthopaedic; In-patient; Day surgery unit; Workload

1. Introduction

Day case surgery is becoming increasingly accepted as a safe and efficient alternative to formal in-patient treatment for many different orthopaedic procedures. Day case procedures may be performed during mixed lists consecutive to in-patient operations or on lists comprising entirely of day cases often in a stand-alone unit. Introduction of a dedicated day surgery unit into the activities of a busy district general hospital orthopaedic department can be achieved smoothly and efficiently. This resulted in a large increase in the number of day case operations, a slight reduction in the number of in-patient operations and an overall increase in workload.

2. Method

The number of operations performed on orthopaedic theatre lists over the final 3 months of an integrated system with day cases intermingled with in-patient cases was audited, retrospectively. Upon the opening of a dedicated day surgery unit separate from the main theatres with its own ward, staff and equipment, lists were then divided into purely in-patient or purely day surgery procedures. A prospective audit of the number of cases was then performed for a further 6 months. The total number of lists performed was not altered. The number of lists switched from the main theatres to the day surgery unit varied from consultant to consultant, ranging from one list a month to one list weekly depending on subspeciality.

3. Results

No surgical complications arose in those patients treated in the day surgery unit. There was no difference in the amount of theatre time or number of lists throughout this 9-month period.

The figures shown in Table 1 demonstrate that the use of dedicated day surgery theatre lists achieved an increase in the total number of orthopaedic cases treated. While there was a small decrease in the number of in-patients treated, this was by far outweighed by a large increase in the volume of day case operations performed. Thus by separating theatre time into dedicated in-patient and day surgery lists an overall increase in workload was achieved.

4. Discussion

With the opening of a new day surgery unit some teething troubles could be expected. Despite this an increase in the number of orthopaedic day cases performed was achieved.

Initially the number of procedures listed for a half-day orthopaedic list was restricted to five due to perceived bed limitations. It soon became clear that this was over-cautious, as lists were finishing early with wasted theatre time. Experience has enabled more efficient planning of lists to make best use of the available operating time with no set limit to the number of cases

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Table 1
Number of cases treated between February and October spanning the opening of the dedicated day surgery unit

	Integrated in-patient and day case lists				After day surgery unit opened separate in-patient and day case lists						
	February	March	April	Average	May	June	July	August	September	October	Average
Day cases	60	64	74	**66**	62	78	76	92	82	81	**79**
In-patient cases	58	58	57	**58**	52	73	55	52	39	45	**53**
Total cases	118	122	131	**124**	114	151	131	144	121	126	**131**
% Day cases	51	52	56	**53**	54	52	58	64	68	64	**60**

listed for one session [1]. The range of procedures performed in the unit is also expanding, bringing variety and interest to day case work. Some more complicated procedures such as shoulder and ankle arthroscopy have been introduced. In addition some simple trauma cases such as removal of wires have been successfully dealt with in the unit, whereas traditionally these would have been placed on the main trauma list. Potentially this could free up main theatre time for more complex trauma cases and reduce the out-of-hours workload.

In future months the number of day case operations performed is likely to rise. The Royal College of Surgeons of England has stated that day surgery is now the best option for 50% of all patients undergoing elective surgical procedures though the proportion will vary amongst specialities [2]. This is particularly attractive given the current climate of bed shortages and waiting lists [3].

5. Conclusion

The transition to using a dedicated day surgery unit can be undertaken smoothly with no detrimental effect to the patients. In fact it allows an increase in the number of day case procedures performed, with only a small reduction in the number of in-patient operations. This reduction could easily be remedied by reassigning lists to main theatres while achieving a slightly smaller increase in day case work. The institution of pure day surgery lists performed in a dedicated day case unit is recommended. This can increase the overall activity of an orthopaedic department while the number of theatre lists stays the same.

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International variations in availability and diffusion of alternatives to in-patient care in Europe: the case of day surgery

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Abstract

Objectives: Technological and medical developments have contributed to the increasing number of surgical procedures carried out as a day-case rather than an inpatient hospital setting. The diffusion of day surgery varies among European countries. This study aims at explaining this variation in healthcare system characteristics. *Methods:* Questionnaires were sent to experts in 12 countries in Northwest Europe. The questionnaire contained questions about the organization and diffusion of day case surgery (at country level and individually for 18 selected procedures), and relevant healthcare system characteristics (financing systems, organization of after care, etc.). *Results:* It is demonstrated that hospital bed supply relates to the diffusion of day surgery. In countries with fewer beds, a higher day surgery rate is found. The financing system of hospitals does not influence the choice of surgical setting. In countries with a fee-for-service financing system for hospital-based physicians, day surgery rates are not higher than in countries with salaried medical specialists. With respect to aftercare, the availability of sufficient home nurses favours day surgery. *Conclusions:* The relative scarcity of hospital beds or large reductions in bed supply has led to the perception of day surgery as an alternative that could meet the growing demand for surgical treatment. It is worthy of note that, although the majority of experts state that financial incentives discourage day surgery, the supply is growing.

Keywords: Diffusion of day surgery; Europe; Healthcare systems; International comparison

1. Introduction

Developments in medical technologies such as endoscopy, laser and ultrasound together with shorter and safer anaesthesia have made medical and surgical treatments less invasive. Some procedures are now so minimally invasive, hospital admission is no longer necessary. At the end of the day, after treatment, patients return home. However, day treatment does not always prevail over more traditional inpatient treatments, since it is not yet common practice everywhere. In the Netherlands only about 1/3 of all elective surgery is performed as day surgery, whereas in the US, day surgery is more common: 2/3 of all elective surgery is day surgery [1]. Obstacles can be found at different levels. First, at the micro level: patients or physicians may not want, or may not be able to use day surgery. For some patients day surgery could be unsuitable because of their health condition (e.g. co-morbidities), social conditions (e.g. no carers at home), or personal preferences [2–4]. On the physician's side there may be problems through lack of experience with new techniques, or doubts concerning the safety of a procedure. For physicians, personal preferences such as a tendency to adopt innovations may also play a part, as may local customs [4–7]. Second, hospital characteristics, such as the organization of hospital care, the number of hospital beds, the size of the hospital, may play a part. Finally, at the macro level, healthcare system characteristics such as financing and insurance influence the

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diffusion of day surgery. It could be argued that obstacles at the micro level are evenly spread over all healthcare systems. Although important, they cannot therefore be considered capable of explaining the differences between countries. The explanation of differences between countries needs to be sought in factors at intermediate and macro levels.

The acute hospital care sector has been subject to change in the last few decades. Two organizational characteristics are highlighted here, namely the decline in hospital bed supply and the changes in hospital financing systems. Day surgery could serve as an alternative to inpatient care in the case of declining bed supply. Most studies concerning the effect of hospital bed supply on hospital bed use fail to include alternatives for inpatient procedures, such as day surgery, or waiting lists [8–11]. The aim of this study is to gain insight into the organizational conditions that favour day surgery as an alternative to inpatient care.

Our research questions were formulated as follows:

1. Do European countries differ in the diffusion of day surgery?
2. Can differences in the diffusion and availability of day surgery be accounted for by healthcare system characteristics?

In this study, we have used the following definition of day surgery: ''Day case surgery can be defined as elective, minor or intermediate procedures performed under local or general anaesthesia on patients who are admitted and discharged during a single working day'' [12].

2. Conditions that influence the use of day surgery

We can divide the conditions that favour day surgery as an alternative to inpatient care into two main categories: organizational characteristics; financial incentives. First, we discuss the possible influence of the characteristics of healthcare organization.

The level of and change in the supply of hospital inpatient beds must be considered. First, it can be expected that hospitals in countries with low bed supply would be more willing than countries with high bed supply to introduce day surgery to relieve pressure on inpatient capacity. For low-supply countries, day surgery might afford the opportunity to reduce waiting lists. In high-supply countries, hospital managers could be expected to prefer sufficient use of the inpatient capacity [13]. Managers may fear bed reductions when working below full capacity. They may also want to see returns on investments made to create the bed capacity (compare Roemer's Law: *a bed built is a bed filled*). Secondly, hospital-bed reductions in the last decade may have contributed to the diffusion of day surgery. In countries undergoing a substantial reduction of hospital beds, the need to introduce day surgery (in order to compensate for the loss of in-patient capacity) may have been felt more strongly.

In addition to triggers from hospital bed supply, day surgery also needs a good organization of and communication with home care (community nurses, general practitioners). In countries where the primary care sector has developed strongly, the introduction of day surgery could be expected to be easier than in countries traditionally more oriented towards secondary care. It is also plausible that, in countries where hospitals have attached outpatient departments, the switch to day surgery would lead to a less fundamental organizational change than in countries where hospital care is mainly devoted to inpatient care. Where no outpatient wards exist, not only would the organization of the hospital have to change; constructional changes would also be needed. So, in countries with hospitals without outpatient departments, the conditions for introducing day surgery as an alternative for in-patient care would be less favourable [14,15].

We now turn to the financial conditions. When day surgery is provided within the hospital environment, the financing of inpatient care is important. Where hospitals are paid per diem, it would be financially attractive to keep patients hospitalized for as long as possible. This would not provide a very favourable financial climate in which to switch to day surgery. In a global-budget situation, where the hospital receives a fixed amount, day surgery would be more attractive, since it is cheaper than inpatient care. However, there is the danger of what is known as the efficiency trap. Day surgery may be cheaper per case but, through greater patient throughput, it may be more expensive than inpatient care in a given budget period [3].

Previous research has revealed that day surgery is not always a substitute for inpatient care; it may be supplementary [6,7]. According to Haworth and Balarajan [6], day surgery may only be a substitute for inpatient care where the population is adequately provided, or even over-provided, with inpatient care. In all other cases, day surgery may be used to reduce waiting lists, or compensate for the loss of inpatient bed supply, in which case no reduction of admission rates would be realized.

Hospitals that have invested in special day surgery wards, or the managers of free standing day surgery wards, would be more eager to promote day surgery in order to have returns on their investments than hospitals where day surgery is performed within the inpatient setting. In addition, the remuneration of the physicians performing the surgery is important. Since nowadays both day surgery and inpatient treatment

are often acceptable, physicians have the opportunity to choose between the two options. In addition to medical arguments, financial incentives may play a part. As Westert and Groenewegen [16] have argued, insofar as medical considerations allow, physicians choose an optimum between income and leisure time. Physicians in salaried service may not be willing to increase productivity, since this would increase workload without further financial gain. On the other hand, the decision of physicians paid on a fee-for-service basis may depend on the level of remuneration. With inpatient surgery better paid than day surgery, there would be no financial incentive to adopt new procedures. On the other hand, if more patients could be treated in day surgery, an increase in income within the same working hours may be achievable.

In summary, we can expect countries with a lower bed supply, a positive financial climate towards day surgery, and pre-existing well developed outpatient and/or primary care to have a higher day surgery rate than countries where these are not in place. In this study, the units of analysis are countries. Although the underlying explanatory mechanisms may operate at intermediate (managerial decision making) or micro levels (clinical decision making), we expect their implications to cluster within countries. The discussion above leads to the following hypotheses:

- Hospital bed supply:
  1. In countries with a high acute care bed supply, day surgery rates are lower than in countries with a low bed supply;
  2. In countries which have experienced a strong reduction of hospital beds, the tendency to look for alternative forms of care is stronger and there is a higher day-surgery rate;
- Aftercare organization:
  3. In countries that are strongly secondary care oriented, the day surgery rate is lower than in countries with a stronger primary care orientation;
  4. In countries where hospitals do not have outpatient departments, the day surgery rate is lower than in countries that do have outpatient departments;
- Financial:
  5. In countries with a global-budget financing system, the day surgery rate is higher than in countries with a *per diem* system;
  6. In countries where physicians are remunerated per case or fee-for-service, the day surgery rate is higher than in countries where physicians receive a (fixed) salary;
  7. In countries where the costs of day surgery are covered by the returns, the day surgery rate is higher than in countries where this is not the case.

3. Data and method

Before the data and method are described, day surgery must first be operationalized. For this study we have used Mascarenhas and Newton's definition as cited above [12]. Unfortunately, this definition does not yield an unambiguous classification of the type of surgery. Confusion with surgical procedures in an outpatient setting is possible. There is not always a clear distinction between a procedure carried out in an outpatient setting, or in day surgery. This lack of precision can even influence national statistics. For instance, in the United Kingdom the Royal College of Surgeons sets targets for day surgery. To achieve these targets, some hospitals shifted some procedures in their registration from outpatient surgery to day surgery [17]. Such lack of transparency is a common problem in health services research [18]. We solved the problem in this study by combining the procedure-specific data for day surgery and outpatient treatment. Moreover, day surgery is known by many different terms: day case treatment and day-care are used in this study as synonyms.

The data came from various sources. First, a questionnaire was sent to day surgery experts in several western European countries. The subset of countries was selected for their comparable level of economic wealth. This is important in order to minimize the disturbing effects of economic constraints on the level of healthcare supply ([19]). In this questionnaire we asked for the organization of day surgery in the country concerned. In addition to these data, we used the OECD health data files of 1999 for data concerning acute care hospital bed supply. Healthcare organization data were obtained via a literature survey carried out in another study dealing with hospital bed reductions [20].

The questionnaire consisted of two parts. The first part contained questions about the diffusion of day surgery (which kind of hospitals, since what date, how many hospitals). For eighteen surgical procedures, we asked to what extent the procedure was performed in inpatient or outpatient/day care. This part of the questionnaire consisted of closed questions. The second part concerned the financing of day surgery; financial, organizational, or medico-technical impediments perceived in the use of day surgery, and the organization of after-care. The questions about after-care and perceived problems were open questions; the remainder of the questions were closed. For countries where more than one expert answered the questionnaire, we combined the answers to obtain one result for that country. When answers differed, we followed the following decision scheme: answers that according to the expert were based on statistical data prevailed over answers based on estimations. When experts clearly contradicted each other, the answers were coded as 'experts contradict

each other' and treated as missing values. Where these rules did not result in a solution, a decision was taken for which the underlying argumentation was documented (to be obtained from the authors on request).

In 1996–1997, the questionnaires were sent to 25 experts in 12 countries. The experts were people who were well informed about the development of day surgery within their own countries. The experts consisted of people who worked at national hospital institutes, innovative hospital physicians who had promoted day surgery at a national level, and researchers who had published on the subject. Before answering the questionnaire, respondents were asked to judge whether they considered themselves to be a suitable expert. In a few cases the recipient of the questionnaire proposed another person who was considered to have more expertise. The response was 72% (18 questionnaires), resulting in at least one completed questionnaire for each of these 12 countries. The experts from France and Italy were not able to provide national statistics on places where procedures were carried out, leaving data from ten countries available for analysis of the procedure settings: Austria, Belgium, Denmark, Finland, Germany, The Netherlands, Norway, Sweden, Switzerland, and the United Kingdom. The data for Switzerland were based on one canton (Zurich). Questions about organization, financing, and perceived problems were answered by all 12 countries.

The degree of day surgery in a country was computed as follows. A subset of 18 procedures was selected and presented to the experts. In addition to frequency of performance, the basis on which the procedures were selected was to ensure that sufficient variation would be available in the conversion of the procedure to day surgery. The procedures range from easily convertible (such as cyst excision) towards procedures difficult to carry out in day surgery (such as prostate surgery). For each of the 18 procedures, the country experts were asked to indicate whether the procedure was carried out as an inpatient, day surgery, or outpatient procedure. The following categories could be chosen: always as a day case/outpatient (more than 90%); mostly as a day case/outpatient (50–90%); mostly as an inpatient (50–90%); always as an inpatient (more than 90%). The categories were coded 1–4, respectively. For all the procedures, all the scores were added and divided by the number of procedures. This process resulted in a score between, and including, 1 and 4: 1 indicates a complete orientation towards inpatient care; 4 indicates a complete orientation towards day case/outpatient care. The validity of this scale was tested with the data collected by De Lathouwer and Poullier [21] who investigated the diffusion of day surgery in 29 OECD countries. In their survey, they aimed at giving the percentage carried out in day surgery for each procedure. They were successful for 13 countries, eight of which were European countries. Six countries participated in both studies. De Lathouwer and Poullier [21] also failed to obtain statistical data from France or Italy. For the seven procedures common to both studies, we recoded these percentages into our categories and compared the rankings of the procedures (the average of all 6 common countries) and country scores in both studies. The procedure rankings were similar. For the ranking in countries, Denmark was an outlier. Apart from this country, the ranking again was similar. The substantial similarity between De Lathouwer and Poullier's findings and our own indicates that the statistical data and estimates were quite reliable within certain boundaries. The only outlier was Denmark. According to De Lathouwer and Poullier's data, Denmark is more inpatient oriented.

To test the hypotheses, we computed Spearman rank-correlations. We chose this method because most of the data were categorical and therefore required a non-parametric method.

4. Results

In half of the western European countries in our study, day surgery had already been performed on a routine basis since before 1980 (Austria, Denmark, Italy, Norway, Switzerland, the United Kingdom). In Belgium and the Netherlands, day surgery was introduced on a large scale between 1980 and 1985. In Finland and Sweden, this type of surgery became common between 1985 and 1990; France and Germany were the last to introduce day surgery on a routine basis. If day surgery is performed in a country, this care is provided to the same extent by all types of hospitals (academic, public, private for profit, private non-profit). Although our experts in Italy and Austria indicated that day surgery had already been performed routinely in their country before 1980, this introduction is not yet countrywide, since this type of procedure is only performed in some hospitals. For Belgium, Finland, the Netherlands and Sweden day case procedures started after 1980, but as in most of the countries that started earlier, the experts reported that day surgery was performed in most or all hospitals. So the period of starting day surgery appears to bear no relationship with its current diffusion.

An important problem concerning the diffusion of day surgery is the lack of financial incentives. In seven of the 12 countries the experts indicated that there was either no financial incentive, or even a negative incentive in the sense that real costs were barely covered, or inpatient procedures were more profitable. On the one hand, two countries (the Netherlands and Denmark) reported an insufficient inpatient bed supply as an incentive to switch to day surgery. On the other hand,

Table 1
Disciplines involved in aftercare ($n = 12$)

Discipline	Involved in number of countries
Hospital	4
GPs	8
Home/community nurses	7

the expert for Austria indicated that the oversupply of inpatient beds had led to a preference for inpatient care.

The importance of the primary care sector can be illustrated by the fact that most respondents indicated that general practioners (GPs) were the most important people involved in aftercare (in eight countries, Table 1). In Denmark, the aftercare for the first 24 h is provided by the hospital; afterwards, GPs and home nurses take over. In UK, the large day centres provide their own aftercare; the smaller centres depend on community-based aftercare. The expert in Norway reported that the hospital-based doctors saw to the aftercare without mentioning the part played by other aftercare providers. In seven countries, the home nurse was also involved. Only one country (Austria) indicated that relatives were involved in aftercare. In Austria the communication between hospitals and GPs was reported to be problematic, so that the quality of aftercare may be endangered.

From Table 1, we can conclude that day surgery has both secondary and primary care elements. For the 18 distinctive procedures, we asked to what extent each procedure was implemented in day surgery. In Table 2, we present the procedures according to the setting in which they are most commonly performed.

Table 2
Classification of procedures towards setting of surgery ($n = 10$)

Almost always in day surgery	Both in day surgery and inpatient surgery	Almost always in inpatient surgery
Excision of a sebaceous cyst	Cystoscopy	Laparoscopic cholecystectomy
Excision of a nevus or lipoma	Dilatation and curettage	Radicular disc replacement
Termination of pregnancy	Adenoidectomy	Prostate surgery
	Cervical cerclage and cone biopsy	Laparoscopic appendicectomy
	Cataract surgery	
	Haemorrhoidectomy	
	Hysteroscopic surgery	
	Knee or meniscus operation	
	Inguinal hernia repair in children	
	Tonsillectomy	
	Inguinal hernia repair in adults	

No data available for Italy and France. The data for Switzerland are based on one Canton (Zurich).

From Table 2, it appears that procedures that require penetration of the skin before performing the procedure and concern for the abdominal space are preferably performed in an inpatient setting. Procedures that concern the skin surface, extremities, or abdominal organs that can be reached without skin penetration are more often performed in day surgery.

On the basis of the answers given concerning the setting of surgery for the selected procedures in each country, a rough classification was made of the degree in the various countries to which day surgery is performed (Table 3).

Table 3 reveals a geographic gradient in the diffusion of day surgery. Broadly, we can state that the more northern a country, the greater the extent of day surgery.

The influence of hospital bed supply on the use of day surgery is now discussed. Hospital bed supply was operationalized as acute care hospital beds per 1000 inhabitants. The data were obtained from the OECD health data files. Change in hospital bed supply was operationalized as the percentage change in beds between 1986 and 1996. The change in hospital beds in absolute terms (in beds per 1000 inhabitants) does not show much variation between countries. However, since the countries vary significantly in the number of beds per 1000 inhabitants, the percentage change also varies considerably (from 1.5% change in Austria to almost 40% in Sweden). Countries with a large supply of acute care beds were more oriented towards inpatient procedures, while countries with a low supply had a higher day case rate (Spearman's $\rho = 0.78$, $P = 0.01$). Countries that experienced substantial reductions in hospital beds also have a higher day case rate (Spearman's $\rho = 0.83$, $P = 0.03$). We conclude that hypotheses 1 and 2, stating that a relative shortage of beds and a substantial reduction of hospital beds are favourable factors for the application of day surgery, are both confirmed by these data.

The orientation towards primary care was operationalized in several ways. First, we used the number of GPs per 1000 inhabitants (more GPs represents a stronger orientation towards primary care); second, we used the percentage of GPs per specialist (a higher percentage indicates a stronger orientation towards primary care). Both data were derived from the OECD health data files. Figures for 1994 were used. A third indicator of orientation towards primary care was the supply of home nurses. Here we used the ranking used in Westert [19]. Neither the number of GPs (Spearman's $\rho = 0.40$, $P = 0.25$) nor the percentage of GPs per specialist (Spearman's $\rho = 0.18$, $P = 0.63$) influence day case orientation. The supply of home nurses corre-

Table 3
Classification of countries towards setting of surgery ($n = 10$)

Mainly day surgery	More day surgery than in-patient surgery	More inpatient surgery than day surgery	Mainly inpatient surgery
Norway	Denmark	Netherlands	Belgium
	Sweden	United Kingdom	Austria
	Finland	Switzerland[a]	Germany

For Italy and France, no data are available on place of surgery.
[a] The ranking of Switzerland is based on the data of only one Canton (Zurich).

lates positively with orientation towards day care (Spearman's $\rho = 0.72$, $P = 0.02$). Two countries in the sample do not have outpatient departments: Denmark and Germany. However, these two countries react quite differently towards day surgery. While in Denmark day surgery is already quite a common alternative to inpatient care, Germany is still mainly oriented towards inpatient care. Overall, we conclude that hypotheses 3 and 4, stating that well developed primary care and the existence of outpatient care favour day surgery, cannot be confirmed by the data. Only the supply of home nurses seems to be related to day surgery positively.

To test the influence of financing systems, the country averages of surgery setting were divided into three categories. In Table 4 an overview is presented on hospital and physician financing systems for each country and the place of surgery.

The hospital financing system seems to have no relationship with surgery setting. The countries within each financing system are evenly distributed over the categories of place of surgery (Table 4). The effect of physician remuneration system transpired to be as follows. Countries where physicians received a salary were more oriented towards day surgery. Neither of the fee-for-service countries scored in the category mainly day surgery. Whether the financial incentives encouraged or discouraged hospitals and physicians, as judged by the experts, seems to be of no importance for the diffusion of day surgery. Countries with negatively and positively evaluated incentives are spread evenly over the categories for the orientation towards day surgery. We conclude that hospitals' financial incentives are unrelated to the availability of surgery in a day setting (rejecting hypotheses 5 and 7). The effect predicted in hypothesis 6, stating that in countries with physicians paid on a fee-for-service basis procedures are more frequently performed in day-case surgery, is contradicted by the results. Only two countries have a fee-for-service system for hospital-based physicians (Netherlands and Belgium). In neither of them is day surgery the dominant setting for the selected surgical procedures.

5. Conclusions and discussion

There are differences in the diffusion of day surgery among the countries of northwest Europe. In the Scandinavian countries, day surgery has become fairly common practice, whereas in the more southern countries inpatient care is still the most favoured type of care. So, the first research question—whether there are differences in the diffusion of day surgery in the European countries—can be answered affirmatively for the countries that participated in our study.

It appears that the supply and substantial changes in supply of hospital beds favour day care surgery. As a result of the relative scarcity of hospital beds in low-supply countries and the large changes in some other countries, day surgery is now perceived as an alternative that can be used to meet the growing demand for healthcare. The ageing of the northwest European population is one of the factors leading to an increasing demand for healthcare, resulting in a growth of admission rates. Since demand is increasing and inpatient capacity is decreasing, day surgery may serve as an alternative to prevent waiting lists from growing excessively. Of course, there is the question of causality. Does bed-supply decrease through the availability of alternatives such as day surgery, or new technologies that shorten length of stay, or is day surgery welcomed as a solution for decreasing inpatient capacity? We consider that day surgery acts as an alternative to decreasing supply, leading to causality running from bed supply to day-surgery, since countries have differed in bed supply for a long time, even before day surgery became more commonplace. So the fact that low supply countries tend to be more enthusiastic in applying day surgery can be seen as an attempt to meet unmet demand. In addition, the hospital bed reductions in northwestern Europe often result from cost containment measures, with Roemer's Law as background: a bed built is a bed filled. No methods are available as yet for the sound estimation of sufficient inpatient care capacity for a given population.

Our hypotheses, that a strong primary care organi-

Table 4
The coherence between financing systems and place of surgery ($n = 10$ countries)

Setting of surgery	Hospital financing			Physician remuneration	
	Global budget	Per diem	Other	Salary	Fee-for-service
Mainly day surgery	1	1	2	4	
Both day surgery and in-patient	1	2		2	1
Mainly in-patient	1	2		2	1

The average scores on setting for surgery for the 18 procedures for each country rank between 1 (over 90% in day surgery) and 4 (over 90% in in-patient setting). The countries were divided into three categories. The first category (average score < 2.5), consisted of Norway, Denmark, Sweden, and Finland. The second category ($2.5 <$ average score < 3) consisted of the Netherlands, United Kingdom, and Switzerland. The third category (all others) consisted of Belgium, Germany and Austria.

zation and the existence of outpatient departments attached to hospitals would favour day surgery, were not confirmed. Only the supply of home nurses seems to affect day surgery. Since many of the countries indicated that home nurses also played a part in aftercare, we can state that countries with a poor organization of home care may face problems in implementing day surgery.

A striking result is that financial incentives for hospitals do not appear to influence the choice for day surgery. A possible explanation for this is that the physicians decide the type of treatment and it may be difficult for the hospital management to influence them. Also for physicians, the remuneration system plays a different part than that expected. Countries with salaried hospital physicians more often apply day surgery. This may be related to the experience of negative financial incentives as, for instance, occurs in the Netherlands. There, a surgeon carrying out inguinal hernia repair receives three times as much for it in inpatient care as would be the case in day surgery [1]. Despite this financial incentive for inpatient treatment, the percentage of inguinal hernia repairs in day surgery in the Netherlands is rising. One explanation may be that the surgeon can do more than three day-case treatments in the time that would be needed for one inpatient treatment. Another possible explanation is that physicians opt for day surgery because of a shortage of inpatient capacity. A third possible explanation is that applying the modern techniques of day surgery may add to the status of the surgeon and the hospital. These possible explanations however need to be tested with the country level data used for this study. A fourth explanation may be that the global budget systems as applied in the countries of northwestern Europe are assessed not only on the basis of objective capitation criteria, but also according to hospital production characteristics. For instance, in the Netherlands formula for hospital budgets, the same procedure in day case treatment would result in a lower budget than for inpatient treatment.

Hypothesis 4, concerned with the effect of the existence of outpatient departments, could not be confirmed in our study. When using De Lathouwer and Poullier's data, a different conclusion may be drawn. Since neither Denmark nor Germany have outpatient departments and since both countries, according to De Lathouwer and Poullier, are inpatient oriented, the conclusion may be drawn that the absence of outpatient departments may indeed slow down the introduction of day surgery. Why the two studies differ in their ranking for Denmark is not clear. The low rate of day surgery in Germany may be explained by the legal constitution. Until recently, hospitals in Germany were not allowed to see patients in an outpatient setting. Since 1992, it has been possible for hospitals to treat patients in day surgery. However, hospitals need constructional and organizational changes to facilitate these changes [15]; this will take time.

This study was carried out at country level and this unavoidably brings with it some imperfections. We were not able to study within-country variations. The use of day surgery within countries varies considerably. This variation may result from specific hospital or physician characteristics that cannot be studied at country level. Since in many countries, healthcare policy is still a national matter, and reforms often affect the whole country, it is necessarily useful to identify the effect of national healthcare organization characteristics and their effect on national level.

In summary we conclude that, of the healthcare system characteristics used in this study, physician remuneration and acute-care hospital bed supply have the strongest relationship with the diffusion of day surgery.

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Undergraduate surgical education in an ambulatory surgery setting

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Abstract

Ambulatory surgery is now well established as an effective method to treat a wide range of surgical conditions. This has resulted in many surgical cases no longer being available as teaching resources for surgical students undertaking their clinical clerkship on a surgical ward. Changes in the final year surgical curriculum at the University of Adelaide resulted in the formation of a day surgery term as a separate option for undergraduates. Educational outcome in the day surgery students, in the form of examination results, was compared with the remainder of the class. There was no difference in objective assessment between the groups. The ambulatory surgery setting offers a viable and alternative teaching environment for undergraduate surgical students.

Keywords: Ambulatory surgery; Undergraduate education; Surgical clerkship

1. Introduction

Over the past 20 years, economic rationalisation of health services has placed focus on work practices with, in many cases, significant changes occurring to long established guidelines for the treatment and management of surgical conditions [1]. A prime example of altered surgical practice, has been in the emergence of ambulatory surgery as an effective method to deal with many surgical conditions that were previously thought to be only amenable to inpatient treatment. Ambulatory surgery has led to the establishment of specialised 'stand-alone' day surgery units, with equally 'specialised' staff trained in the unique needs of patients undergoing a procedure in the day surgery unit. Initial estimations that up to 50% of all surgery would eventually be performed in the ambulatory setting [2] have been surpassed in many countries and increasingly more complex cases are being attempted with same day discharge as the final aim [3].

While the transfer of many surgical cases to the day surgery unit has led to savings in economic terms, a potential negative impact on surgical undergraduate education may have occurred. The education of senior surgical undergraduates has traditionally taken place on a surgical 'clerkship', effectively an apprenticeship in an inpatient setting. Students would be expected to be involved with the day to day activities of the surgical unit, including the clerking of patients prior to surgery. In previous years, almost without exception, patients would be admitted the day prior to surgery, thereby enabling the student to take an adequate history and perform a thorough examination. The changes in surgical practice have now resulted in even the most major cases being admitted on the morning of surgery, with minor cases now diverted to day surgery. The student undertaking their traditional surgical clerkship has little opportunity to examine common surgical conditions.

The undergraduate teaching opportunities that a day surgery unit provides has attracted attention from educational researchers [4–8]. It has been suggested that in many instances the ambulatory surgery setting is underutilised as a source of student teaching [8]. The smooth running of the units have not been disrupted by the presence of students and many of the day surgery stakeholders feel that the units are enhanced by the students [4]. The undergraduates themselves remark

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that their surgical skills and knowledge have been improved during their time on the unit [5]. Little information is available, however, on the immediate educational outcome achieved in the ambulatory surgery setting when compared with the traditional surgical teaching venues [7]. The aim of this study is to establish an ambulatory surgery student clerkship as a surgical elective term and compare the results of the students undertaking this term with the remaining student group.

2. Method

Rotation through the day surgery unit had been possible for final year surgical students from the University of Adelaide as a 4-week component of their 8-week surgical term at The Queen Elizabeth Hospital, a major teaching hospital in Adelaide, South Australia. In 1997, the curriculum committee resolved to introduce a larger community medical education component into the undergraduate course and as a result, students would have the opportunity to select a 4-week surgical term in a field of interest to them. Subsequently terms in plastics, orthopaedics, rural surgery, ophthalmology and day surgery were devised. In addition, all students were required to complete a 4-week general surgical term in a metropolitan teaching hospital.

The students who chose to undertake a term on the day surgery unit were given an orientation session their first day and also a log book to record their clinical experiences. A list of all patients undergoing procedures for the week was made available to the students and they allocated the patients amongst themselves. Each patient was expected to followed 'longitudinally' for their entire stay in the day surgery unit and in this way the student had the opportunity to be involved in history, examination, anaesthesia, operative procedure, recovery and discharge planning.

Subjective student assessment for the new terms consisted of the standard University of Adelaide assessment form, used for many years in the traditional clerkship and usually completed by the respective head of unit. Students were awarded one of three grades, A, B, or C for three separate clinical categories. These were the ability to take a history and perform a clinical examination, the ability to synthesise and use clinical information, inter-personal and communication skills. For the day surgery term, this assessment was made in the presence of the student by two Department of Surgery members at a feedback session held for each student on the last day of their term. The final year written examinations and Objective Structured Clinical Examination (OSCE) remained unchanged from previous years.

3. Results

In 1998, the first year of the new final year surgical curriculum at the University of Adelaide, a total of 23 students chose to perform their elective surgical term on the day surgery unit at The Queen Elizabeth Hospital. The total class size for the 1998 sixth year group was 117 students.

In terms of subjective assessment, there were statistical differences in the grades received by the day surgery students when compared with grades obtained by the group of students who remained in city hospitals to complete their 4-week surgical elective term. Significant differences in the subjective grading assessment were also seen in the group of students who completed a rural surgical term as their surgical elective, where it was found that it was more difficult to gain the highest grade compared with their day surgery counterparts (Table 1).

Final examination assessments were collated in three categories for each student. These were the surgical exam mark, the clinical competency exam result and the overall sixth year result. When compared with the group of students who remained in the city for their surgical elective term and the group who completed their elective term in a rural centre, no statistically significant differences in any of the three categories were noted (Table 2).

A total of 20 logbooks were returned by the students and on inspection, a wide variety of cases were seen by the students ranging from gynaecology to plastic surgery with an average of 15 cases per student seen per term.

Table 1
Comparison of subjective assessments between the day surgery students and the rural surgery students

Grades	Day surgery students ($n = 23$)	Rural surgery students ($n = 42$)	P-value (significant P-value < 0.05)
Clinical category 1 A grade	23	25	
Clinical category 1 B grade	0	17	Clinical category 1 P-value < 0.01
Clinical category 2 A grade	23	24	
Clinical category 2 B grade	0	18	Clinical category 2 P-value < 0.01
Clinical category 3 A grade	23	23	
Clinical category 3 B grade	0	19	Clinical category 3 P-value < 0.01

Table 2
Comparison of mean scores (obtained for three objective categories) between the day surgery group of students, the rural surgery student group and the remainder of the class

Student groups	Clinical competency	Surgery exam result	Overall result
Day surgery	64.91	65.00	64.37
Rural surgery	65.21	65.00	64.71
City-based surgical elective terms	65.21	64.83	64.65

Using the Kruskal–Wallis χ^2-square test, no significant P-values (where $P<0.05$) were obtained between any of the groups.

4. Discussion

Current trends in medical education revolve around developing a more relevant and community orientated undergraduate curriculum [9]. This, in part, involves creating new surgical teaching environments outside of the traditional tertiary hospital surgical clerkship. Ambulatory surgery encapsulates many aspects of the new educational approach and along with outpatient teaching and attachments in rural hospitals represent potential learning opportunities for surgical undergraduates. Provided that the units are not overloaded with students, the smooth running of the day surgery is not compromised and it has been shown that students make a significant contribution to quality of patient care [4].

In addition to a community based focus for medical education, another change in the direction of the undergraduate curriculum is in the realisation that the end-product of the medical course should be the 'undifferentiated' practitioner [10,11]. The medical student, therefore, requires a solid grounding in the management of common surgical conditions they are likely to encounter as a general practitioner. This type of broad exposure on the increasingly specialised general surgical units in the teriary city hospitals is difficult to achieve, however, the day surgery unit is ideally placed to provide the surgical experiences required for the primary care practitioner. Varicose veins, ganglions, skin lesions and inguinal herniaes are the types of problems which abound in general practice and the surgical management of these can only be seen in the ambulatory surgery setting. It could be argued that a term on a day surgery unit may hold more practical relevance than a corresponding period of time attached to a teaching hospital general surgical unit.

In terms of measurable educational outcome, no differences were detected between those students that undertook a day surgery unit attachment compared with the remainder of the class. Although not a 'clerkship' in the traditional sense, this finding is consistent with other studies looking at final exam results amongst students performing surgical clerkships at different locations [12,13]. An evaluation study of a day surgery unit as a teaching facility in the UK found strikingly similar results to those obtained in our study [7]. This study concluded that the day surgery attachment prepared the student as well as other courses for their end-of-year examinations.

The educational value of the day surgery terms were on par with the other surgical elective terms on offer and given the structure of the term and emphasis on self-directed learning, the day surgery term represents an ideal environment for the practise of adult learning principles. In addition to self-directed learning, the basis of adult learning includes that adult learning efforts are problem centred and that teachers become facilitators of learning [14]. The 'longitudinal' patient exposure, although somewhat compacted when compared with the community medicine model, also embraces modern educational theory with an increased emphasis on problem based learning [15]. The long-term outcome measure of the success or otherwise of the day surgery term would involve evaluating how the graduate performs as a medical practitioner and graduate follow-up studies would be required [16].

The differences in subjective grading detected between the day surgery group and the remainder of the surgical elective group warrants some discussion. Studies have shown subjective assessments with less than four descriptors are inherently flawed due to preceptors' reluctance to award the lowest grade [17]. In the entire surgical elective group, no student received a C grading. The other factor that may play a role in the differences in assessments may be the amount of time each supervisor spent with the student. In the case of the day surgery unit, the two representatives from the Department of Surgery responsible for the subjective assessments both had fortnightly operating lists in the day surgery unit and were available to the students, if required, during working hours. The rural surgeons were in the position of having daily regular contact with the students and it could be proposed that the subjective assessments provided by the rural preceptors are a more accurate reflection of the students' progress than those assessments provided by the day surgery counterparts.

Given the fact that most tertiary hospitals now have dedicated day surgery units, opportunity exists to incorporate these units into the surgical curriculum as learning environments for surgical students and evidence

suggests that currently these facilities are being underutilised as teaching options. The results of this study indicate that the day surgery unit can provide a broad surgical experience for the undergraduate, adheres to modern educational theory, and in terms of educational outcome is no different to other surgical elective options.

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