

Editorial

"Everything has its season, and there is a time for everything under the heaven"

The wise King Solomon understood the complexities of the universe, and almost prophetically predicted the conclusions that we are beginning to arrive at during our lifetime. This is the season and the time for our specialty of ambulatory surgery and anesthesia to influence the present and shape the future of health care delivery. No longer is ambulatory surgery an option. Within the pages of this issue, and repeatedly reiterated in prior issues, is the forum to share the vast experiences touting the safety and quality of ambulatory surgery. Further attestation to our legitimacy is the formation of the International Association for Ambulatory Surgery (IAAS), that took place this year in Brussels. Anesthesiologists, surgeons, nurses, administrators, and government officials whose common interests in the provision of surgical and medical care on an outpatient basis were identified, forged ahead on an international level in order to provide colleagues with common ground for information sharing. Both the debate surrounding the conceptual validity of ambulatory surgery and the mission of the IAAS are featured in this issue. The future of any such an organization lies in the education and research that is disseminated to its recipients. A prime example of important clinical research, is the continued interest in perioperative management of pain and emesis. Featured in this issue are three articles that examine opioid and nonopioid treatment of pain following oral and dental surgery. Cost-effective rational selection should drive the decision when clinical efficacies are equal. And the debate continues. Also featured in this issue is the result of a multi-centered U.S. study assessing admissions following ambulatory surgery. The data shed light on the external and internal pressures that exist in the expanding ambulatory surgical practices. For those facilities that are still struggling with patient and procedure selection, this study identifies the variability in practice patterns – some admissions will always occur, and some should never occur. The U.S. experience highlights some of the problems that more fledgling institutions will face, and perhaps could be forearmed.

It is truly hoped that scientific and scholarly efforts will continue to be shared through this journal, and that priority by government and industry resources to support meaningful clinical investigations and outcomes research will further encourage the proliferation of ambulatory surgery. Let us witness this *"time and season!"*

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Pre-emptive analgesia reduces postoperative pain experience following oral day case surgery

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Modern concepts of acute pain generation emphasize that surgical trauma may lead to hyperexcitability of dorsal horn sensory neurones, resulting in amplification and prolongation of postoperative pain; these effects may be reduced or eliminated by pre-emptive analgesics. Thirty patients undergoing day case general anaesthetic surgical removal of impacted mandibular third molar teeth were entered into a double-blind, placebo-controlled, randomized study and instructed on the use of the visual analogue scale (VAS) for pain assessment. Patients received one of three test solutions (tramadol 100 mg, ketorolac 30 mg or placebo) intravenously after anaesthetic induction and VAS scores were measured every 30 min for 2.5 h postoperatively. Results confirmed that preoperative administration of tramadol reduced pain experience postoperatively, compared with placebo; comparison with preoperative ketorolac revealed reduced pain scores during the later postoperative period, fewer patients requiring additional analgesics in the initial recovery period and a longer time before first dose 'escape analgesia'.

Key words: Day surgery, pre-emptive analgesia, postoperative pain

Introduction

Recent clinical studies have shown that patients often experience sub-optimal analgesia following surgical procedures^{1,2}; effective treatment of postoperative pain is a major priority for clinical research in surgical practice, not only to improve patient comfort but also to ensure satisfactory outcome following the surgical stress response³. Recent advances in our understanding of acute pain physiology have introduced the concept of pre-emptive analgesia⁴; analgesia administered prior to painful surgical stimuli is believed to prevent or reduce subsequent pain development⁵.

Pathophysiological studies suggest that the nervous system does not modulate all pain in a fixed manner, but rather can respond to some stimuli with a degree of plasticity; once induced such neuroplasticity may sustain and magnify the pain experience⁶. Surgical tissue damage leads to a dual phenomenon of central and peripheral nerve sensitization; central sensitization, mediated via N-methyl-D-aspartic acid (NMDA) receptors in the dorsal horn, prolongs and increases sensitivity to noxious stimuli over an expanded receptive field

(hyperalgesia) and results in pain from previously innocuous stimuli (allodynia). Repetition of such stimuli leads to a progressively escalating degree of hyperexcitability termed 'wind up'⁴.

Peripheral sensitization, via chemical mediators such as leukotrienes, bradykinin, histamine, arachidonic acid metabolites and sympathetic activity, may occur at the site of injury and surrounding tissue leading to localized hyperalgesia⁴.

Pre-emptive analgesia should therefore be possible with agents which interfere with such central and peripheral mechanisms. Indeed, premedication with intravenous opioids has been shown to reduce postoperative pain, presumably by preventing central sensitization, following orthopaedic and abdominal surgery^{7,8}. Similarly, non-steroidal anti-inflammatory drugs (NSAIDs) given before surgery have been shown to have postoperative analgesic effects^{9,10}.

The surgical removal of impacted mandibular third molar teeth can result in intense postoperative pain¹¹, and indeed, has become an internationally accepted clinical pain model. The aim of this investigation was to assess the extent of pain reduction after third molar surgery when either tramadol (an opioid centrally-acting analgesic) or ketorolac (NSAID) was administered intravenously preoperatively, compared with control groups, and to identify any significant adverse effects.

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Materials and methods

Thirty patients (22 female, 8 male; mean age 23 yr; ASA class I fitness) undergoing day case general anaesthetic surgical removal of impacted mandibular third molar teeth were, following local ethics committee approval, entered into a double-blind, placebo-controlled, randomized study and instructed on the use of the visual analogue scale (VAS) for pain assessment.

Patients were randomly allocated to receive one of three test solutions (tramadol 100 mg, ketorolac 30 mg or placebo) administered as 10 ml over 1 min immediately after anaesthetic induction (5 min before commencement of surgery). A standardized anaesthetic regime (without the use of intraoperative analgesics) was utilized throughout and surgical procedures, which all required the removal of bone prior to tooth disimpaction, were similarly standardized and performed by the same surgeon. VAS pain scores were measured at 30, 60, 90, 120 and 150 min postoperatively; soluble ibuprofen 400 mg was made available as 'escape analgesia'.

Respiratory function was assessed by pulse oximetry measurement of haemoglobin oxygen saturation levels intraoperatively, continuously postoperatively for 10 min and then at 15 and 30 min postoperatively. Similarly, intraoperative recordings were made of pulse and blood pressure and any significant changes in pulse rate or blood pressure noted.

Any other adverse effects were also recorded, such as excessive bleeding intra- or postoperatively and the occurrence of nausea and vomiting during the recovery period.

Results

Figure 1 confirms that VAS pain scores were highest for the placebo group throughout the postoperative period; whilst pain experience for all three groups was similar in the initial postoperative period, tramadol patients demonstrated significantly lower pain scores between 90 and 150 min postoperatively. Statistical comparison at 120 min, for example, revealed a significant reduction in pain scores between tramadol and placebo groups ($P = 0.02$; Wilcoxon's non-parametric testing).

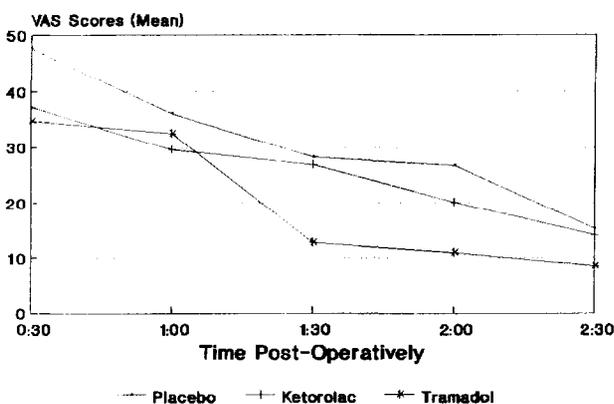


Figure 1. Pain scores.

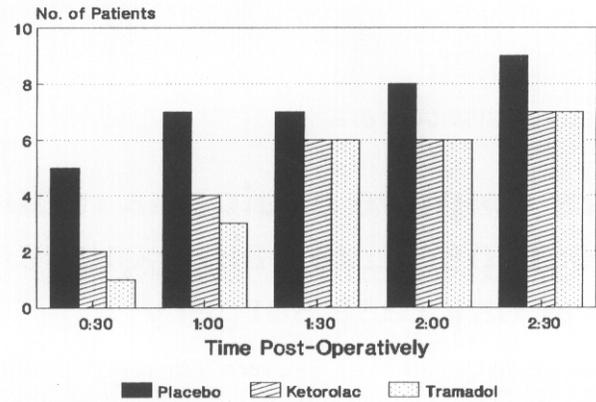


Figure 2. Use of escape analgesia.

Figure 2 illustrates that more placebo patients required 'escape analgesia' throughout the postoperative period than either ketorolac or tramadol patients, whose demands for additional analgesia were very similar, except during the first 60 min postoperatively when slightly more ketorolac patients required 'escape analgesia'.

Table 1 demonstrates that the mean time to receiving 'escape analgesia' was shortest for the placebo group (53 min) and longest for the tramadol group (66 min).

Figure 3 compares haemoglobin oxygen saturation intraoperatively and postoperatively for the three experimental groups. Whilst there were no significant differences in respiratory function between placebo and tramadol patients, statistical analysis confirms that at 15 min post-operation the ketorolac patients exhibited significantly lower oxygen saturations compared with the placebo group ($P = 0.03$; Wilcoxon's non-parametric testing).

Table 1. Time to first does escape analgesia

	Mean time (min)	Range (min)
Placebo group	53	10-150
Ketorolac group	60	25-140
Tramadol group	66	30-150

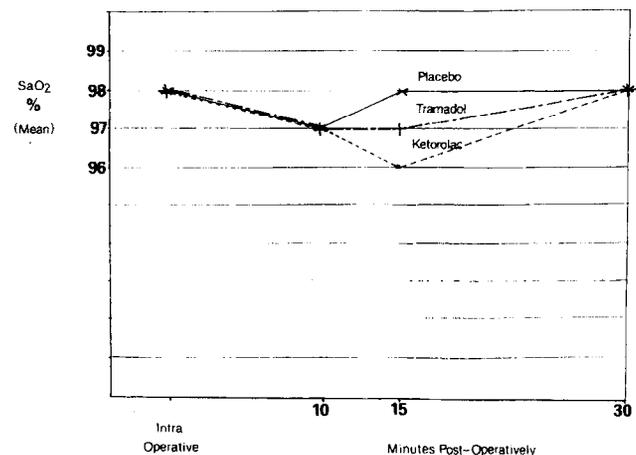


Figure 3. Oxygen saturations.

Adverse effects were recorded in each experimental group: 30% of the placebo patients demonstrated significant increases in heart rate and/or blood pressure during the surgical procedure; significant change was deemed to occur if the heart rate increased by >40 beats per min or the diastolic blood pressure rose to 100 or above. Such changes were presumed to result from inadequate intraoperative analgesia. Thirty per cent of ketorolac patients were noted to bleed excessively intraoperatively, whilst a further 10% bled excessively during the postoperative period. Sixty per cent of tramadol patients reported dizziness between 120 and 150 min postoperatively; this contrasts with 0% for the placebo group and 20% for the ketorolac group (at 30–60 min postoperatively).

Discussion

Tramadol is a centrally acting analgesic of the opioid agonist type that can relieve moderate to severe pain and has been demonstrated to be an effective postoperative analgesic^{12,13}. In comparison to other centrally acting agents, negligible respiratory depressant activity has been reported¹²; other side-effects such as constipation, impaired micturition, euphoria and dependency are believed to be rare.

Immediate relief of acute postoperative pain requires parenteral analgesic administration and 100 mg tramadol has been shown to be the optimal dose¹⁴. In this study tramadol 100 mg was administered intravenously as a centrally acting pre-emptive agent prior to third molar surgery and provided improved pain relief compared with placebo, although this effect appeared most significant between 90 and 150 min post-surgery. Fewer tramadol patients required 'escape analgesics' throughout the postoperative period, compared with the placebo group; such reduction in the consumption of escape medication following tramadol administration has been reported previously¹⁴.

Pulse oximetry assessment of respiratory function revealed no significant depressant effects of tramadol, either intraoperatively or in the immediate postoperative period, compared with placebo patients, which supports previous reports of negligible respiratory depression¹⁵; this is clearly advantageous for patients undergoing surgery of the upper aerodigestive tract on a day-stay basis.

The main disadvantage of tramadol in this study was the high incidence of reported dizziness, especially common between 120 and 150 min postoperatively. Dizziness, nausea and trembling are amongst the recognized side-effects of tramadol¹⁶; their occurrence 2 h post-surgery might well limit the usefulness of this agent for day-case patients likely to be discharged 2–3 h postoperatively.

Ketorolac is a non-steroidal anti-inflammatory agent recommended for short-term management of moderate to severe, acute postoperative pain, and which exhibits no opioid related side-effects^{17,18}; its peripheral mode of action is to inhibit the cyclo-oxygenase enzyme system

and hence prostaglandin synthesis. The analgesic efficacy of ketorolac has been demonstrated to be comparable to morphine and superior to ibuprofen, paracetamol or codeine preparations/combinations in recent clinical trials^{19–21}. In this study patients received 30 mg ketorolac intravenously in the immediate preoperative period and exhibited reduced pain scores throughout the observed period and required less 'escape analgesics' compared with control patients, although in the latter postoperative period patients receiving tramadol experienced least pain.

Recent reports, however, have emphasized potentially serious and even fatal adverse reactions associated with the use of ketorolac, including gastrointestinal ulceration and haemorrhage, renal impairment and anaphylaxis²². Recommendation has thus been made to reduce the parenteral starting dose to 10 mg, with subsequent doses of 10–30 mg available at 4–6 hourly intervals.

Forty per cent of patients receiving preoperative ketorolac were reported to exhibit excessive bleeding either intraoperatively or immediately postoperatively; ketorolac is known to inhibit platelet aggregation and prolong bleeding time and postoperative wound haemorrhage has been reported following perioperative parenteral use¹⁷. Strict haemostasis is an important principle in day-case surgery and the potent anti-platelet effects of NSAIDs have previously been cited as possible contraindications in their perioperative use^{22,23}.

It is interesting that pulse oximetry confirmed a reduction in oxygen saturation in patients receiving ketorolac 15 min postoperatively because it is currently believed that NSAIDs do not cause respiratory depression²³; despite statistically demonstrated significance, the clinical relevance of a mean oxygen saturation of 96% (range 94–98%) compared with 98% for control patients (range 97–99%) remains questionable.

Recent reports have suggested that NSAIDs may also exhibit, in addition to their peripheral effects, central mechanisms of action on dorsal horn nociceptors²⁴; possible synergistic effects comprising inactivation of centrally-acting neuroactive substances together with inhibition of prostaglandin synthesis may help explain the well reported efficacy of NSAIDs in managing acute postoperative pain²⁵.

It is therefore clear that preoperative administration of either tramadol or ketorolac reduces postoperative pain experience following third molar surgery, although both agents demonstrated side-effects which may limit their usefulness for day-case surgery.

The key question, however, in relation to pre-emptive analgesia is whether analgesic intervention before surgery is more efficient than the same intervention following surgery; further research is required in this particular area, together with additional studies to establish optimal selection and timing of analgesic administration.

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Codafen continus® analgesia for dental day surgery (comparison of codafen continus vs. diclofenac)

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Satisfactory postoperative analgesia for intermediate day surgical procedures is a challenge for anaesthetists. This prospective, randomized, double-blind study examined the efficacy of a new combined analgesic tablet for dental day cases. Codafen continus® is an analgesic preparation containing ibuprofen controlled release 300 mg and codeine phosphate normal release 20 mg. This combination was compared with diclofenac 75 mg for pain relief following day case extraction of third molar teeth. There were no differences between the two preparations with respect to the amount of analgesia provided as measured by categorical pain scores and the use of escape analgesia. The study confirmed that analgesia provided by codafen continus was as effective as diclofenac 75 mg and no serious side-effects were noted.

Key words: Day surgery, dental, postoperative analgesia, non-steroidal anti-inflammatory drugs

Introduction

With the expansion of day surgery there is a need to develop and test safe analgesics for day cases. Codafen continus® tablet (ibuprofen controlled release 300 mg/codeine phosphate normal release 20 mg tablet) is a novel combination of controlled release ibuprofen and normal release codeine phosphate in a bilayer tablet which may be used to improve postoperative analgesia and reduce inflammation. After preliminary clinical use it was thought that this new formulation could represent an improvement on previous oral analgesics and might be suitable for postoperative pain relief following day surgery. Ibuprofen has already been shown to have analgesic properties in the treatment of pain following dental surgery¹. Furthermore, a greater analgesic effect had been reported with the combination of ibuprofen and codeine than either agent alone². Removal of third molars under general anaesthesia may result in severe pain and local oedema. Audit of postoperative pain following this procedure within the Addenbrooke's Day Surgery Unit (DSU) has revealed a need for improved analgesic medication for a period of up to 5 days after surgery.

The aims of this study were to compare the effectiveness and tolerability of oral codafen continus with

diclofenac, a drug commonly used for the relief of postoperative pain in this group of patients.

Methods

The study was approved by the Local Research Ethics Committee and each patient gave informed consent. One hundred and six patients of physical status ASA I or II, scheduled to undergo day surgical removal of three or four third molar teeth under general anaesthesia were recruited. The study was performed in a double-blind, placebo-controlled manner and all operations were performed in the DSU.

Patients were stratified by surgeon and gender and were then randomized to receive either diclofenac or codafen continus. The first dose of study medication (either 75 mg diclofenac or two codafen continus tablets) was given 2 h preoperatively with 50 ml of clear fluid and further identical doses were given at 12, 24 and 36 h after the first dose. Breakthrough medication for pain consisted of paracetamol 0.5-1 g 4 hourly as required to a maximum of eight tablets in 24 h.

All patients were anaesthetized using a standard anaesthetic technique which included induction and maintenance of anaesthesia with propofol and alfentanil. Patients breathed 30% oxygen in nitrous oxide spontaneously via a laryngeal mask airway and monitoring included non-invasive blood pressure, heart rate, ECG, inspired oxygen and end-tidal carbon dioxide concentration and pulse oximetry. Surgeons were asked,

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Table 1. Patient demography: age, height and weight, mean (SD)

	<i>Codafen continus</i>			<i>Diclofenac</i>			<i>All patients</i> n = 106
	<i>Female</i> n = 36	<i>Male</i> n = 17	<i>All</i> n = 53	<i>Female</i> n = 34	<i>Male</i> n = 19	<i>All</i> n = 53	
Age (years)	23.0 (4.89)	23.2 (3.29)	23.1 (4.41)	23.4 (3.67)	24.2 (4.01)	23.7 (3.77)	23.4 (4.10)
Height (cm)	164.9 (6.58)	179.5 (6.37)	169.6 (9.43)	166.1 (6.43)	179.4 (6.13)	170.7 (8.96)	170.1 (9.17)
Weight (kg)	59.5 (8.92)	79.2 (10.23)	65.8 (13.13)	61.7 (8.86)	76.1 (9.97)	66.8 (11.51)	66.3 (12.3)

at the end of the procedure, to assess the degree of trauma caused by surgery. This parameter was measured using a 7 point categorical scale ranging from 1 (no trauma) to 7 (severe trauma).

The main outcome measures of analgesic efficacy were time to first request for analgesia, categorical pain scores and the use of escape analgesia. On discharge patients were invited to take home and complete a diary. In this they recorded their categorical pain scores (a 9 point scale was used where 0 represented 'no pain' and 8 represented 'very severe pain'), consumption of escape analgesics and the presence and severity of side-effects at set times. These times were:

1. prior to receiving the first dose of test medication,
2. prior to induction of anaesthesia,
3. on recovery from anaesthesia,
4. on discharge from the DSU,
5. at 8 h post-first dose,
6. at the time of receiving the second dose of test medication,
7. on waking on the next two mornings,
8. prior to receiving the doses at 24 and 36 h post-first dose,
9. at 48 h post-first dose.

Drug tolerability was also recorded and the specific symptoms assessed were difficulty with breathing and concentration, constipation, drowsiness, dizziness, impaired energy, headache, nausea, insomnia, vomiting and weakness. All patients were requested to rate each of these symptoms on a five point severity scale (none, mild, moderate, severe or very severe).

The pain intensity scores at each time point were assessed by analysis of variance taking into account the stratification of randomization by surgeon and patient gender. The total number of analgesic doses required throughout the study was also analysed using this model. The interval between recovery and the first dose of analgesic taken was analysed using the Wilcoxon rank sum test, and the incidence and severity of side-effect symptoms using Fisher's exact test. Differences between the groups were judged to be significant if $P < 0.05$. The trauma inflicted in removing the teeth was included as a co-variate.

Results

Of one hundred and six patients recruited to the study, four failed to return their patient assessment diaries and one was withdrawn from the study because of severe postoperative pain requiring parenteral opioids and admission to the inpatient ward. Table 1 shows no differences in demographic details between the two groups of patients studied.

There were also no differences between the groups in duration of anaesthesia, time to immediate recovery as shown in Table 2, or surgical assessment of the degree of trauma as shown in Table 3.

Assessment of efficacy

No difference in analgesic efficacy was demonstrated; the time of first postoperative analgesic requirement and the total number of doses of escape analgesics required during the study period being comparable between the two groups studied (Table 4).

Again, as shown in Figure 1, there were no significant differences between the two treatment groups in pain intensity scores. Female patients had significantly higher pain scores than male patients throughout the study

Table 2. Details of anaesthesia: duration of anaesthesia and time to recovery, mean (SD)

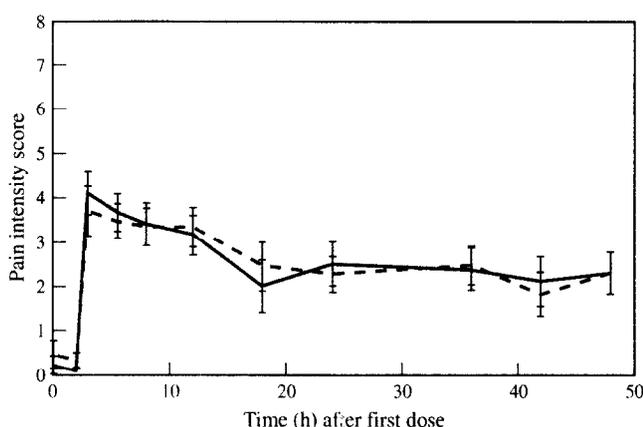
	<i>Codafen continus</i> n = 53	<i>Diclofenac</i> n = 53
Duration of anaesthesia (min)	20.8 (10.4)	21.6 (9.41)
Time to recovery (min)	8.7 (5.3)	9.5 (5.4)

Table 3. Amount of trauma caused by dental surgery: trauma score, mean (SD)

	<i>Codafen continus</i> n = 53	<i>Diclofenac</i> n = 53
Amount of trauma	4.11 (1.5)	4.08 (1.45)

Table 4. Time to first escape analgesia and total number of doses of escape analgesia received during the study period

	<i>Codafen continus</i> n = 53	<i>Diclofenac</i> n = 53
Interval between recovery and escape analgesia in h, mean (25th and 75th centiles)	0.89 (0.58–2.69)	2.30 (0.79–4.5)
Number of doses of escape analgesia received per patient, mean (SD)	2.92 (2.15)	3.13 (2.17)

**Figure 1.** Pain intensity scores.

period. The amount of surgical trauma inflicted as assessed by the surgeon had some influence on the post-operative pain intensity scores at every measurement point from 8 h after the first dose of study medication (about 4 h postoperatively) to the end of the study period.

Assessment of tolerability

On recovery from anaesthesia, patients in the codafen continus group reported more weakness and difficulty concentrating than did patients in the diclofenac group (Fisher's exact test $P = 0.031$ and $P = 0.015$, respectively). Patients in the codafen continus group continued to report more weakness on assessment at discharge ($P = 0.028$), at 8 h post-first dose ($P = 0.042$), and prior to receiving the second dose of study medication ($P = 0.021$). Thereafter there were no differences between the groups in the reporting of this symptom. Also there were no other significant differences between the groups in the reporting of other symptoms at any assessment time in the study.

Discussion

The National Health Service Management Executive Task Force Report on Day Surgery, 1993, stated that day surgery could now be considered the best option for 50% of elective surgical cases⁵. At Addenbrooke's, the department of oral and maxillofacial surgery is currently performing over 60% of its workload on a day

case basis. In 1994, audit within this day unit showed that while 70% of patients had little or no pain post-operatively, 14% had moderate or severe pain in the recovery area⁶. There is therefore a need for continued research to identify the best analgesic regimen.

Non-steroidal anti-inflammatory drugs (NSAIDs) have been shown to demonstrate an opioid sparing effect after many types of surgery, including day case procedures, and the reduced use of opioids has been associated with particular advantages for day case patients, including earlier patient discharge⁷. Combination therapy with opioids, NSAIDs and local anaesthetic agents where appropriate is the logical way to prevent and treat postoperative pain whilst reducing the unwanted side-effects of each individual drug group. Although it is recognized that NSAIDs may be useful as analgesics after day case surgery, patients should be carefully screened if the well known side-effects of these drugs are to be avoided, e.g. bronchospasm, renal impairment, gastric irritation and haemorrhage. Audit in the Addenbrooke's DSU in 1994 revealed that patients complained of more recovery room pain and that the use of NSAIDs was decreased as compared with the results from 1993⁶. The reasons for this may be that several recent publications have highlighted the potential adverse effects of NSAID therapy^{4,8,9}. There is wide variation in the relative toxicity of these drugs, however, and ibuprofen (the NSAID present in codafen continus) has an excellent safety record when compared to other drugs in this class⁴. Indeed, ibuprofen is now available as a non-prescription medicine in the UK. In addition, combination therapy with normal release preparations of ibuprofen and codeine have already been shown to be of value following oral surgery¹⁰⁻¹². Diclofenac has also been used effectively as an analgesic following dental surgery³.

We have shown that codafen continus is as efficacious as diclofenac for pain relief after dental day surgery. The dose of codafen continus used in the study (two tablets 12 hourly) is the recommended starting dose and may be increased to three tablets 12 hourly. The dose of diclofenac used, however, is the recommended maximum daily dose (150 mg in 24 h). While this study was not designed to demonstrate pre-emptive analgesia, the preoperative use of oral analgesics is logical in order that they may be effective during the recovery period. This study did not demonstrate any adverse effects, in particular clinically significant bleeding, associated with the preoperative use of NSAIDs. Both drugs were well tolerated by fasting patients although the increased weakness postoperatively reported in those patients given codafen continus is difficult to explain.

Finally, this study showed that the degree of surgical trauma associated with the extraction of third molar teeth influenced the severity of postoperative pain. Consideration should be given to the development of a surgical scoring system to predict the probable degree of surgical trauma involved in such extractions. This would enable improved day surgery patient selection and the optimization of postoperative analgesic protocols.

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A placebo controlled comparison of ketorolac and fentanyl for use in day case oral surgery

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The analgesic, recovery and cardiorespiratory characteristics of ketorolac trometamol, a non-opioid analgesic, were compared with that of fentanyl and a placebo when used intraoperatively during day case oral surgery. One hundred and twenty-seven patients were entered into a double blind randomized, placebo controlled study. The results of the AUC (area under the curve) analysis of postoperative pain scores showed that patients receiving ketorolac experienced significantly less pain than those in the placebo group ($P = 0.001$). Patients in the ketorolac group recovered more quickly, as measured by the Maddox Wing test, than those in the fentanyl group ($P = 0.03$ at 1.5 h). Analysis of adverse events reported showed that patients receiving fentanyl experienced significantly more episodes of apnoea intraoperatively than patients in the other two groups ($P = 0.001$).

Key words: Ketorolac, day surgery, oral surgery

Introduction

In the UK there has been a large increase in the number of surgical procedures performed on a day case basis; a method recognized by the Royal College of Surgeons as a cost effective use of services¹. Such a service demands that patients experience few complications during anaesthesia and surgery and that they recover promptly and are provided with adequate pain relief.

Fentanyl is a short-acting opioid that is commonly used during day case surgery. Opioids are used during anaesthesia as part of a 'balanced' anaesthetic technique to provide analgesia. Ketorolac is a non-steroidal anti-inflammatory drug (NSAID) which has been shown to be an effective oral postoperative analgesic². It is also available as an intravenous preparation and this study was designed to compare its effectiveness with fentanyl when administered at induction of anaesthesia.

Methods

One hundred and twenty-nine patients requiring surgical removal of their lower third molars and/or upper third molars if appropriate were entered into a randomized, double blind comparison of a single intravenous bolus dose of ketorolac, fentanyl or placebo.

Randomization into three groups was carried out

using a computer generated set of random figures and standard exclusion and inclusion criteria were used when admitting patients to the study. All patients were of ASA type I or II fitness and had their surgery performed under general anaesthesia as day cases.

Anaesthetic regime

At induction all patients received propofol 2.5 mg kg⁻¹ and suxamethonium 600 µg kg⁻¹. Patients were intubated using a nasotracheal tube and maintenance anaesthesia was provided using either isoflurane 2.5% (range 1-2.5%) or halothane 1.5% (range 0.5-2%) together with a 2:1 nitrous oxide: oxygen gas mixture with a fresh gas flow of 6 l min⁻¹.

Drug regime

Immediately before the start of surgery, group I received ketorolac 30 mg, group II received fentanyl 100 µg and group III received an ethanolic isotonic solution of saline as placebo. All these drugs were administered as an intravenous bolus dose of 3 ml vol over 60 s.

Postoperative rescue medication was packaged in a blind fashion and administered according to the entry code of the patient into the study in order that the patients who had received intravenous ketorolac at induction received oral ketorolac as rescue and patients who had received intravenous fentanyl or placebo received oral ibuprofen.

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Statistics

All tests were 2-tailed at the 5% significance level and examined differences between all pairs of treatments for the following clinical measurements.

Clinical measurements

Vital signs

Continuous monitoring of pulse rate (beats per min), blood pressure (systolic/diastolic mmHg) using a Datascope Accutor I (Datascope Medical Company Ltd, Huntingdon, UK).

Respiratory rate was monitored continuously using a capnograph. Oxygen saturation (SaO₂) using an Ohmeda Biox pulse oximeter 3700E (British Oxygen Co. Distributors, Birmingham, UK).

Pain severity

Using a 10 cm visual analogue scale preoperatively (as baseline) and postoperatively at: 15, 30 and 45 min and 1, 1.5, 2 and 3 h.

The area under the curve from 15 min to 3 h was measured and compared using the Wilcoxon rank sum test.

Time to rescue medication

Analysis was performed using standard survival analysis methods and the median times to remediation estimated using the Kaplan-Meier estimator.

Time to recovery

Time to recovery was measured using the Maddox Wing test³ preoperatively (as baseline) and postoperatively at: 15, 30 and 45 min and 1, 1.5, 2 and 3 h.

Any adverse events were recorded.

Results

Demography

One hundred and twenty-nine patients were entered into the study but two did not receive their study med-

ication and were withdrawn. The remaining 127 were all included in the safety analysis but two patients in group II were given postoperative analgesics outside the protocol and one patient in group I did not receive the correct amount of study medication. These three patients were thus withdrawn from the efficacy analysis. Results from 50 patients in group I, 47 in group II and 27 in group III were analysed. The groups were evenly matched for sex, age and weight and the median duration of surgery was similar in all groups at just over 30 min. Most patients (101) received maintenance anaesthesia as isoflurane/N₂O/O₂ the remainder (23) received halothane/N₂O/O₂.

Vital signs

A summary of the changes in vital signs can be seen in Table 1. Baseline signs were similar in all groups.

Pulse rate and systolic blood pressure tended to increase during surgery but there were no significant differences in the median change between the groups. Oxygen saturation remained within acceptable limits throughout anaesthesia.

Respiration tended to decrease during surgery. Patients in the ketorolac and the placebo group changed by -3 breaths and -6 breaths per min respectively.

Patients in the fentanyl group however, behaved in a markedly different way. More than half of the patients receiving fentanyl experienced apnoea and thus the median value for minimum respiration rate in this group was 0 breaths per min. Hence the median change was -20 breaths per min, a significant difference from patients in the placebo and ketorolac groups ($P = 0.001$).

Postoperative pain scores

Analysis of the AUC values (15 min - 3 h) revealed that the pain experienced by patients in group I was less than that experienced by patients in group III and that this difference was statistically significant ($P = 0.01$).

Table 1. Summary of vital signs

	Ketorolac	Placebo	Fentanyl
Systolic BP (mmHg)			
Baseline (median)	110	110	110
Surgery max (median)	128	133	130
Change (median)	14	20	21
Pulse rate (beats min ⁻¹)			
Baseline (median)	76	78	76
Surgery max (median)	105	105	97
Change (median)	29	26	19
Respiration rate (breaths min ⁻¹)			
Baseline (median)	22	24	24
Surgery min (median)	19	18	0
Change (median)	-3	-6	-20
Oxygen saturation (%)			
Range during surgery	91-100	92-100	91-100

Table 2. Area under the VAS curve from 15 min to 3 h (mm)

	Ketorolac	Placebo	Fentanyl
Number of patients	50	27	47
Median	24.8	31.4	24.7
Range	0.00–70.2	10.4–81.6	3.0–92.8

Treatment comparisons (Wilcoxon rank sum test)

Ketorolac vs fentanyl $P = 0.27$

Ketorolac vs placebo $P = 0.01$

Fentanyl vs placebo $P = 0.14$

Table 3. Time to first postoperative remedication (min)

	Ketorolac	Placebo	Fentanyl
Number of patients	50	27	47
Estimated time* by which 75% patients remedicated	214.0	130.0	146.0

*By Kaplan-Meier test.

Treatment comparisons (Wilcoxon rank sum test)

Ketorolac vs fentanyl $P = 0.48$

Ketorolac vs placebo $P = 0.73$

Fentanyl vs placebo $P = 0.95$

There were no other significant differences between the treatments (Table 2).

Time to rescue medication

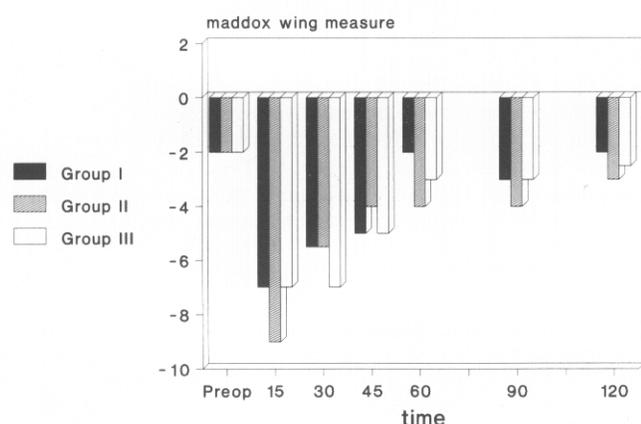
There was no difference in the overall shape of the survival curves when these were examined using the Wilcoxon analysis (Table 3).

Time to recovery

At 1.5 h patients in group I were significantly more recovered as measured by the criteria of the Maddox Wing test than those in group II ($P = 0.03$). At 2 h the difference in recovery between these two groups approached significance again in favour of group I ($P = 0.06$), no other treatment comparisons showed significance (Figure 1).

Adverse events

Eighty-seven adverse events were recorded for 66 patients (Table 4). Of these events nine (10%) in group I, 44 (50%) in group II and eight (9%) in group III

**Figure 1.** Time to recovery (Maddox Wing).

required action. It is suggested that if the treatment regimes were of equal efficacy then there would be the same proportion of actionable events in each study group. The observed proportions indicate a statistically significant difference ($P = 0.01$) in the number of events in each group and this is almost entirely due to the large number in group II, most of which were due to apnoea during the intraoperative period (Figure 2). Other adverse events were of small numbers only and there was no statistical difference in frequency between groups.

Discussion

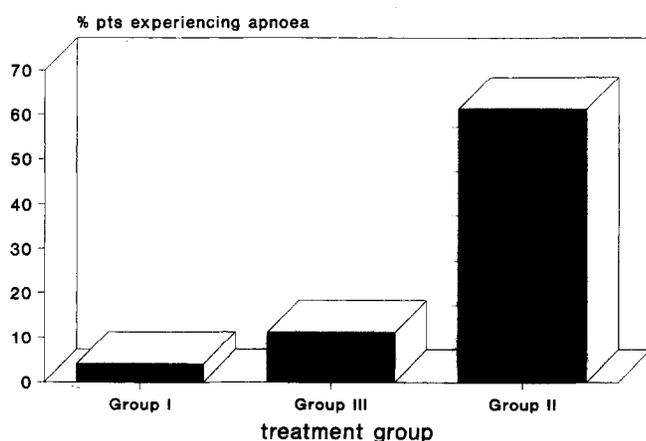
The essence of day case surgery is that patients are discharged early and safely to their home environment. A good service aims for minimization of anaesthetic side-effects, few surgical complications and good postoperative analgesia.

Patients receiving fentanyl throughout this study encountered more intraoperative adverse events in the form of apnoeic episodes than patients in the other two groups and it is suggested that since intervention was required for most of these events this is an undesirable effect of fentanyl.

Due to its rapid onset and short duration of action fentanyl is often used in anaesthesia⁴. Others however, have expressed anxiety due to the degree of respiratory depression observed in patients receiving fentanyl⁵ and it has been noted that fentanyl may even produce such effects in the postoperative period⁶. This study supports some of these findings in that there was a significant difference in the incidence of apnoea in the group of patients who received fentanyl perioperatively compared with those patients who received either ketorolac or placebo. Others have also used ketorolac during anaesthesia and have shown that no respiratory depressant effects are observed⁷. Murray et al. (1989) also showed that patients receiving ketorolac showed no

Table 4. Summary of adverse events

Adverse event	Group I No. of patients	Group II No. of patients	Group III No. of patients
Pain	1 (5%)	1 (2%)	1 (8%)
Apnoea	2 (10%)	30 (56%)	3 (25%)
Hypoventilation	9 (43%)	5 (9%)	1 (8%)
Nausea	1 (5%)	5 (9%)	2 (17%)
Multifocal extrasystoles	1 (5%)	2 (4%)	2 (17%)
Dizziness	1 (5%)	1 (2%)	1 (8%)
Sore throat	-	-	-
Vomiting	-	4 (7%)	-
Bradycardia	1 (5%)	2 (4%)	-
Haemorrhage	2 (10%)	1 (2%)	-
Syncope	1 (5%)	1 (2%)	-
Bigeminy	1 (5%)	1 (2%)	-
Headache	-	-	-
Ventricular extrasystoles	-	1 (2%)	1 (8%)

**Figure 2.** Frequency of occurrence of apnoea.

changes in heart rate and mean arterial blood pressure compared with a group receiving alfentanil who experienced a fall in the value of both of these variables.

In this study, blood pressure and pulse rate increased during surgery in all study groups. However there were no significant differences in the changes between groups.

There was little difference in postoperative pain scores between the treatment groups, this was perhaps due to the relatively short duration of analgesic action of both active preparations when administered intravenously. The AUC analysis showed that ketorolac provided better pain relief than placebo and this may be useful as patients, once recovered, can be given an oral ketorolac regime before loss of analgesia from the intraoperative dose occurs.

Examination of time taken to recovery as measured using the Maddox Wing test showed that patients who had received ketorolac were significantly more recovered than those who had received fentanyl at 1.5 h ($P = 0.03$) and even by 2 h postoperatively the difference in recovery values still approached significance in favour of the patients receiving ketorolac ($P = 0.06$). This sug-

gests that fentanyl may prolong recovery from anaesthesia in the early postoperative period and this may ultimately lead to a delay in the discharge of patients.

In conclusion, it is suggested that for patients undergoing day case surgery where a rapid recovery time allied to good pain control is required, the use of intravenous ketorolac during surgery may offer advantages over the current practice of administration of short and ultra-short acting opioid preparations.

Acknowledgements

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Paediatric ambulatory anaesthesia

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The tenth annual general meeting of the Society for Ambulatory Anesthesia was held on 27-30 April, 1995 in Indian Wells, California, USA. The 2 h session addressed five different current concerns in paediatric ambulatory anaesthesia.

The first lecture, entitled controversies with muscle relaxants, was presented by Dennis M Fisher MD of San Francisco, CA. Dr Fisher's presentation was primarily concerned with the current controversy with the use of succinylcholine in paediatric anaesthesia. Dr Fisher reviewed the current US FDA labelling of succinylcholine and reminded the audience that this was the first instance when the FDA has agreed to re-revise a label for a drug within a period of 2 yr. The current label for succinylcholine includes a 'boxed warning' which indicates that the use of the drug can be associated with cardiac arrest in a small number of patients due to hyperkalaemia.

Dr Fisher, who is known to take the position that succinylcholine should not be used in children, reviewed the current understanding of the potential problem of succinylcholine being associated with malignant hyperthermia especially when a volatile anaesthetic such as halothane is also administered. He also indicated that there may be up to 1% incidence of masseter muscle rigidity which can, in some patients, be associated with malignant hyperthermia. Dr Fisher noted that when an intravenous anaesthetic such as sodium thiopentone is used, the incidence of masseter muscle spasm is greatly decreased. Dr Fisher also emphasized that cardiac arrest due to hyperkalaemia was mostly observed in a small number of patients with an undiagnosed myopathy.

Dr Fisher presented data to indicate that with the availability of the newer intermediate- to short-acting muscle relaxants, namely mivacurium and rocuronium, the need for succinylcholine in his own practice is virtually nil. He indicated that the very brief duration of mivacurium makes it his drug of choice for elective intubation, and that the short onset time of rocuronium

makes it his drug choice for rapid sequence inductions in infants and children. (Editor's comment: rocuronium is not universally accepted as a substitute for succinylcholine for rapid sequence inductions.)

Dr Fisher then presented data to review attempts at finding drugs that can be effective intramuscularly to replace succinylcholine. Currently succinylcholine is the only drug that has been known to be clinically effective following intramuscular administration and has a quick onset. Mivacurium has been found to be disappointing in that regard because it has a very long onset time even with extremely high doses. Dr Fisher indicated, however, that im rocuronium may be a useful drug for that purpose because twitch and ventilatory depression can occur in approximately 2 min, which would make the drug clinically useful for intramuscular administration.

The second lecture dealt with the issue of fasting before or after surgery. This was presented by Dr Mark Schreiner MD from the Children's Hospital of Philadelphia.

Dr Schreiner reviewed the current literature and indicated that for the past 5 yr or so clinical investigators began to question the necessity for a prolonged pre-operative fast. Numerous studies have shown that ingestion of clear liquids up to 2 or 3 h before surgery had no deleterious effect on gastric emptying time, and no increased risk of pulmonary aspiration. The main benefit of drinking clear liquids before surgery was that it made the wait for surgery more tolerable and pleasant for the children. With that practice followed since 1989 in his hospital, over 40 000 children have been anaesthetized after 2 h of fasting. He was not aware of any complications as a result of the shortened fast.

Dr Schreiner then addressed the current practice in his institution of keeping children NPO after surgery. He indicated that vomiting is the most common post-operative complication of anaesthesia and surgery, and it is one of the main reasons why patients are not discharged home soon following high risk procedures such as eye muscle surgery, orchiopexy and so on. He reviewed studies performed in his institution indicating that children who are forced to drink fluids before they are allowed to go home have more vomiting and therefore stay in the hospital longer than children who are kept fasting and are allowed to drink only when they

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request to do so. He therefore advocates that otherwise healthy elective ambulatory patients drink clear liquids up to 2 h before surgery, get proper intravenous hydration during the perioperative period, and are then encouraged to remain fasting after surgery so that there is minimal vomiting and no delay in discharge home.

The third lecture dealt with premedication/preinduction techniques in paediatric ambulatory patients and was presented by J Lance Lichtor MD from the University of Chicago.

Dr Lichtor started by addressing the issue of preoperative screening that should be conducted before the day of surgery. He indicated that the methods of screening can include telephone calls to the patients and parents at home or a visit and tour of the facility some time prior to the day of surgery. He quoted studies showing that the rate of cancellation of elective surgery is significantly lower in patients who undergo this kind of screening than in patients who are not screened. Dr Lichtor also reviewed the reasons for cancellation on the day of surgery. These included upper respiratory infection (URI), wheezing, fever of unknown aetiology and violation of NPO status. He also indicated that there is a continuing controversy about the need for preoperative haematocrit determinations in these patients and he is of the opinion that haematocrit is a test that should only be done when there is a medical indication for its performance. For example, patients with a history of prematurity who are undergoing surgery shortly after birth, since in these patients low haematocrit can predict postoperative apnoea.

Dr Lichtor then reviewed the use of premedication in ambulatory patients. He indicated that premedication is usually used to minimize separation anxiety and to facilitate the induction of anaesthesia. Currently the use of oral midazolam in a dose of 0.5 mg kg⁻¹ orally is a fairly popular technique in the United States. Because of its very bitter taste, midazolam should be mixed with a sweet solution such as liquid Tylenol or melted frozen fruit juices. Currently the oral transmucosal fentanyl citrate preparation known as Oralet is becoming available for preoperative administration in children. Although it results in sedation 25–30 min following its consumption, there are some opioid-related side-effects such as increased nausea, vomiting, itching, etc. With Oralet, postoperative analgesic requirements are decreased. Dr Lichtor also reviewed the use of antiemetics in ambulatory patients. He indicated that although droperidol in a dose of 50–70 µg kg⁻¹ is useful to control postoperative nausea and vomiting, it results in a high incidence of sedation which can delay discharge from the hospital. Metoclopramide continues to be a very popular drug for that purpose and has few side-effects. Other drugs such as ondansetron are now available and are extremely effective in combating nausea and vomiting, however they are significantly more expensive than droperidol.

The fourth lecture addressed the role of parents in paediatric ambulatory anaesthesia and was presented by Raafat S Hannallah MD from Children's National

Medical Center in Washington DC. Dr Hannallah noted that although the issue is still controversial, the practice of allowing parents to be present during the induction of anaesthesia in their children is becoming fairly popular in the US at the present time. Actually, when he asked for a show of hand, approximately 80% of the attendees at the meeting indicated that they would consider allowing parents to be present during anaesthesia induction in children. The presence of parents is claimed to decrease the anxiety of the children, especially pre-schoolers, at the time of induction and therefore minimize the use of preoperative sedation in these patients. Dr Hannallah indicated that there are some institutions where there are special induction rooms to allow the parents to be present during induction without having to change into hospital attire which is less threatening for the children and much more convenient for the parents. Alternatively, when induction rooms are not available, many practitioners allow the parents to change into OR attire or wear a coverall-type gown and actually accompany the children into the operating room itself and be present during induction. With this approach the parents can be present during any kind of induction, for example, intravenous, inhalational, and so on. In some places where parents are not generally allowed to be present during the actual induction, the anaesthesiologist may allow the parents to be present during the administration of preinduction drugs. The most common and most popular technique for that purpose is either rectal methohexital, rectal or nasal administration of midazolam in a holding area that is outside the operating room suite and is equipped with a source of oxygen and a bag and mask. The parents can be present until the child starts to fall asleep and is wheeled into the operating room to continue the induction. Dr Hannallah reviewed the studies that showed that the presence of the parents actually decreased anxiety and crying during the induction of anaesthesia. There is very little evidence, however, that there are any long term benefits in children who have their parents with them during induction or long-term psychological complications in children who did not have their parents with them during the induction.

Some authors have indicated that parents who are extremely anxious should not be encouraged to accompany their children during induction. Those who are invited to watch their children must be told exactly what to expect and must agree to leave the induction area if so asked by the anaesthesiologist. Very anxious parents can actually result in increased anxiety in their children and should not be allowed to be present.

The last presentation in that session was by Steven C Hall MD who is from the Children's Memorial Hospital in Chicago. That session dealt with postanesthesia care units (PACU) in paediatric patients. Dr Hall discussed the problem of the child who has delayed emergence. He indicated that beyond the usual catastrophic causes of hypoxaemia, airway obstruction, pneumothorax, metabolic disturbances, hypothermia is a commonly overlooked cause of delayed emergence in children. He

emphasized the need for keeping infants and children warm during surgery.

Dr Hall also indicated that there is a wide variability in children's response to the anaesthetic agents. Some children awake immediately while others are slow to respond and take longer to become completely alert. He also indicated that younger children tend to wake up and then nap for the rest of the day and although there is a great emphasis in our system on having children 'street ready' as quickly as possible after surgery, it should be remembered that the normal response of some children to the stresses of hospitalization and surgery would be to nap. He suggested that in those instances we try to resist efforts to arouse the child prematurely.

Dr Hall then addressed the problem of a child with emergence delirium. He indicated that when this occurs it can be due to potentially hazardous and treatable conditions that should be evaluated first, such as hypoxaemia, hypoventilation, acidosis, hypotension and increased intracranial pressure. Once these life-threatening conditions are eliminated the other possibilities can be pain or fear and these should be considered. Pain should be treated as aggressively as possible. Awakening in a strange environment may also result in agitation. Lastly, agitation may be related to agents given in the operating room. For example, the use of scopolamine or the new inhalational agent desflurane may be associated with such a response.

Dr Hall then discussed the problem of a child with postintubation croup, which is more common in children than it is in adults because of the narrowness of the airway at the level of the cricoid. Postintubation croup usually becomes symptomatic within the first

hour after extubation. It characteristically presents with a barking cough, retractions and tachypnoea. The initial therapy is usually humidified oxygen with face mask. Nebulized racemic epinephrine is commonly administered by face mask to vasoconstrict the laryngeal mucosa. Because of the short duration of action, the patient must be examined after 1 h to see if there has been a rebound re-occurrence of oedema and obstruction. Although a single treatment is usually adequate, there may be a need to repeat racemic epinephrine and some children may require admission to the hospital for overnight observation if the need for treatment persists.

Finally, Dr Hall addressed the problem of the risk of postanaesthetic apnoea in premature infants. He indicated that although several studies have shown that infants who are born prematurely continue to have a risk of apnoea until they are 44 to 46 weeks postconceptual age, recent examination of the same data suggests that if we are to decrease the risk of post-discharge apnoea significantly it may be necessary to admit to hospital infants who are born prematurely, if their age at the time of surgery is less than 55 weeks (postconceptual age). Central nervous system stimulants such as intravenous caffeine have been shown to result in a significant decrease of apnoea in these high risk infants. Although the results of these studies are encouraging, only small numbers of patients have been studied and confirmation will be needed before caffeine can always be assumed to be effective. In most practices, even if caffeine is administered intravenously to prevent postoperative apnoea, infants with a history of prematurity who are still under 55 weeks postconceptual age are still admitted to the hospital for postoperative monitoring for apnoea and bradycardia.

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Low-dose propofol for the treatment of postoperative emesis in children

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The objective of this study was to determine the efficacy of intravenous (iv), low-dose propofol for the treatment of postoperative emesis in children. We performed a randomized, prospective, double-blind, placebo-controlled investigation in the ambulatory surgical unit on 90 healthy children, aged 1-16 yr following elective, outpatient surgery. After an episode of postoperative vomiting, patients were randomized to receive iv propofol, 0.25 mg kg⁻¹, or an equivalent volume of 10% lipid emulsion (Intralipid®). A second dose of study drug was administered if emesis recurred. All episodes of emesis and postinjection sedation scores following study drug administration were recorded. The study was terminated after analysing the results of 45 children in each group. There were no complications in either study group. We concluded that propofol 0.25 mg kg⁻¹ was not an effective treatment for postoperative emesis in healthy children undergoing elective outpatient surgery. It is possible that increasing the dose and/or the duration of administration may improve propofol's ability to treat postoperative emesis in children.

Key words: Anaesthesia: paediatric; complications, postoperative: vomiting; antiemetic: propofol

Introduction

With an incidence of 20-33%, emesis is the most common postoperative complication in paediatric ambulatory patients^{1,2}. Not only is it bothersome because of its unpleasant and oftentimes painful nature, but it may contribute to parental and patient anxiety, dehydration, post-tonsillectomy rebleeding, and is the main cause of unanticipated overnight admission for the ambulatory surgical unit^{2,3}.

A variety of agents may be used to treat postoperative emesis in children. These include trimethobenzamide, prochlorperazine, metoclopramide, droperidol and serotonin antagonists such as ondansetron. These agents have varying degrees of effectiveness and some are associated with unacceptable side effects, such as excess sedation and extrapyramidal movements. A more effective strategy might be to prevent postoperative emesis by administering antiemetics before certain high risk surgical procedures such as tonsillectomy⁴ or strabismus repair⁵. However, routine prophylaxis will invariably expose some children to potential risks and additional expense and will not be effective in all cases anyway. Recent studies in the paediatric population have demonstrated that propofol, when used for induc-

tion or maintenance of general anaesthesia, decreased the incidence of postoperative emesis by as much as 50%^{6,7}. In adults, propofol was superior to placebo in treating postoperative nausea and vomiting⁸ and is postulated to possess direct antiemetic activity^{8,9}.

The objective of this prospective, randomized, double-blind, placebo-controlled study was to determine the efficacy of intravenous (iv), low-dose propofol for the management of postoperative emesis in children undergoing elective, outpatient surgery.

Methods

Healthy (ASA I and II) children, aged 1-16 yr who had indwelling intravenous catheters inserted while undergoing elective, outpatient surgery were eligible to participate. Exclusions included children with a known allergy to propofol or its constituents (egg products), having any pre-existing systemic disease, taking medication affecting the upper gastrointestinal tract, or greater than 150% ideal body weight. Written and verbal informed consent was obtained from parents and children (where appropriate). Prior approval was obtained by the Research Subjects' Review Board of Strong Memorial Hospital.

Preoperative fasting, premedication, intraoperative fluids and anaesthetic management were not dictated by the study. After an episode of vomiting or retching in the postanesthesia care unit (PACU) or ambulatory

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surgical unit (ASU), children were randomized to receive either iv propofol 0.25 mg kg⁻¹, or placebo (10% lipid emulsion – Intralipid®). Intralipid by itself does not possess antiemetic properties¹⁰. Lidocaine 1% was added to each study syringe in an equal volume as the study medication (equivalent to 0.25 mg kg⁻¹ lidocaine) to prevent pain on injection of propofol¹¹. The study medications were computer-randomized and provided to us by the clinical pharmacy in coded syringes. One of the authors (AAB) was a blinded observer and recorded a sedation score (adapted from Borgeat et al.⁸) before and 60 s after injection (1 = fully awake; 2 = somnolent – responds to verbal stimulation; 3 = somnolent – responds only to tactile stimulation; 4 = asleep – responds only to noxious stimulation). The times of all subsequent episodes of emesis were recorded. If a second episode of vomiting occurred, a second dose from the same syringe was administered and sedation scores were recorded as before. Additional emesis was treated using other antiemetics as prescribed by the surgical or anaesthetic care team. Patients were discharged according to routine age-appropriate discharge criteria and were not required to drink before going home. All parents were telephoned the following day to determine the incidence and times of emesis following discharge. The following patient characteristics and anaesthetic or surgical factors were determined: age, sex, weight, type of surgery and whether opioids or reversal agents were administered.

To determine differences between the propofol and placebo groups, statistical analysis was performed using the Mann–Whitney U test for nonparametric interval data and χ^2 and Fisher exact analysis for nominal data. A *P* value <0.05 was taken to indicate statistical significance. All statistical calculations were performed by SigmaStat statistical software for Windows (Jandel, San Rafael, CA).

Results

Ninety patients were enrolled after being identified as having either vomited or retched while in the ASU. Table 1 lists the patient characteristics and Table 2 compares the types of surgery performed in the two groups. Nearly all children received oral midazolam premedication and most had induction of anaesthesia using inhalation anaesthesia with halothane and nitrous oxide. Eight children in the control group and five children in the propofol group received propofol as part of their anaesthetic management (*P* = 0.4). Initial success (defined as lack of recurrent emesis within 30 min) after the first dose of study drug was achieved in 38 patients (84%) who received propofol and 35 patients (78%) who received placebo (*P* = 0.4). Twenty-one patients (47%) who received propofol and 16 patients (36%) who received placebo were completely emesis-free after the first dose (*P* = 0.3). The median time to relapse was 22 min after receiving propofol and 24 min after placebo (*P* = 0.6). Initial success after the second dose of study drug was achieved in 20 of 24 patients (83%) who

Table 1. Patient characteristics

	Propofol	Control
<i>n</i>	45	45
Age (yr)*	5.7 ± 3	6.7 ± 3.4
Weight (kg)*	23.5 ± 12.3	25.8 ± 11.2
Sex (M : F)	29 : 16	28 : 17
Opioids (Y : N)	35 : 10	36 : 9
Muscle relaxants (Y : N)	36 : 9	33 : 12
Reversal agents (Y : N)	17 : 28	19 : 26

* Mean ± SD.

There were no statistically significant differences between the groups.

Table 2. Types of surgery

	Propofol	Control
ENT	30	27
Ophtho	0	3
Dental	3	2
General/GU	8	8
Peripheral	4	5

P > 0.5 for 2 × 5 table (χ^2).

received propofol and 23 of 29 patients (80%) who received placebo (*P* = 0.7). Following the second dose of study drug, 12 of 24 patients (50%) who received propofol and 9 of 29 patients (31%) who received placebo were completely emesis free (*P* = 0.2). The median times to relapse after the second dose were 25 min in the propofol group and 40 min in the placebo group (*P* = 0.2). When the results from the two doses were combined, 20 children (44%) who received placebo had subsequent emesis as opposed to only 12 children (27%) who received propofol. This difference approached statistical significance (*P* = 0.07). When only those children who received intraoperative opioids and only those who received reversal agents (neostigmine in all cases) were analysed separately, the similarities in responses remained between the propofol and placebo groups. Of 68 total injections of propofol, 9 children (13%) had an increase in their sedation score as compared with 7 of 67 (10%) injections of placebo (*P* = 0.6). There were no apparent complications in either study group.

Discussion

Our study in children was initiated following a report by Borgeat et al. who demonstrated that propofol successfully alleviated postoperative nausea in adults⁸. However, they too demonstrated that emesis relapse rates within 30 min were similar for both propofol and placebo groups. While Borgeat et al. lumped together nausea and vomiting to arrive at a 60 s postinjection improvement score, we did not attempt to identify or treat nausea. If propofol is more effective in alleviating nausea than vomiting in children, we would not have identified this.

It is possible that 0.25 mg kg⁻¹ of propofol was too low a dose to demonstrate an antiemetic effect in our paediatric patients. Propofol requirements for induction

and maintenance of general anaesthesia are increased in the paediatric population^{12,13}. A larger dose may result in a stronger antiemetic effect. Although not statistically significant, more patients assigned to receive propofol had ultimate relief from subsequent emetic episodes, indicating that propofol may be more successful if used in larger doses or administered over a longer time period. A dose-response study would be useful to delineate this phenomenon and to measure the dose at which side effects (e.g. sedation) occur.

Lidocaine, 0.25 mg kg⁻¹, was added to both the propofol and placebo syringes to mask the pain associated with the injection of propofol. Lidocaine decreases the incidence of postoperative emesis in children undergoing strabismus repair but in larger doses than those given to our patients¹⁴. Since lidocaine was added to both treatment groups it is unlikely that its administration appreciably affected the results.

Caution should be used when interpreting a negative study such as this. It is entirely possible that a type II statistical error occurred, in that 90 patients may have been too small a sample to detect significant differences between the groups. However, since analysis of the results on 90 patients showed no clinically significant decrease in emesis with propofol, we decided not to enroll more patients (even though doing so may have resulted in a statistically significant difference) so that more effective antiemetics could be used in our paediatric patients. Based on a method proposed by Detsky and Sackett with which to assess negative trials, 90 patients was sufficient to exclude a true risk reduction of 25%¹⁵.

In summary, we found that the administration of propofol 0.25 mg kg⁻¹, to treat postoperative emesis in children, was not associated with a decrease in subsequent emetic episodes. On the basis of our results, we recommend that future investigations assess higher dose regimens of propofol and/or longer durations of administration.

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The relationship of preoperative and intraoperative factors on the incidence of pain following ambulatory surgery

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Despite the growth of ambulatory surgery, little information is available concerning patients' recovery following discharge. The purpose of this study was to determine the incidence and severity of postoperative pain and pain-related outcomes such as sleep and activity disturbance following a wide variety of ambulatory surgical procedures. Second, this study attempted to identify a correlation between preoperative and intraoperative variables and the level of postoperative pain experienced after discharge. One hundred and eighty-nine adult patients undergoing a variety of outpatient surgical procedures were studied. Data collected included preoperative pain and anxiety ratings, preoperative medication use, type and location of surgery, type of anaesthetic, postoperative pain ratings and the occurrence of pain-related outcomes during the 24 h following surgery. Seventy-four per cent of patients experienced moderate or severe pain following discharge, 32% reported sleep disturbance and 34% reported activity disturbance secondary to pain. Preoperative anxiety level, level of pain expectation, use of psychoactive medications and pain level at the time of discharge were significantly correlated with the greatest level of pain following discharge. These results suggest that pain following ambulatory surgery is a significant problem and that patients who are at greatest risk of this complication may be identified preoperatively in order to target pain-specific therapies toward this group and improve recovery.

Key words: Ambulatory surgery, postoperative pain, anxiety, pain expectation

Introduction

Ambulatory surgery continues to grow rapidly in the US in response to pressure to control costs. Currently, approximately 60% of elective surgical procedures in the US are performed on an outpatient basis. While the incidence of pain among inpatients has been characterized in several studies^{1,2}, the incidence of pain following outpatient surgery, especially pain experienced following discharge, is relatively unknown.

Postoperative pain in ambulatory surgery is an important issue for many reasons. The negative physiological and psychological effects³⁻⁶ of postoperative pain are well recognized. Because of the adverse consequences of postoperative pain, the US Department of Health and Human Services recently published guidelines for the management of postoperative pain⁷. In addition, uncontrolled pain is one of the

leading causes of unplanned admission following ambulatory surgery⁸ which may significantly increase the cost of healthcare.

The purpose of this study was to determine the incidence and severity of postoperative pain and pain-related outcomes such as sleep and activity disturbance following a variety of ambulatory surgical procedures. Second, we attempted to identify preoperative and intraoperative variables that correlated with an increased incidence and severity of pain following discharge after outpatient surgery.

Methods

The study was approved by the Committee on the Protection of the Rights of Human Subjects of the University of North Carolina, Chapel Hill. Informed consent was obtained and complete data was obtained from 189 adult patients presenting for outpatient surgery. Preoperatively, patients completed a survey assessing their anxiety, pain expectation, use of analgesics and psychoactive medications (anxiolytics,

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antidepressants and antipsychotics), prior history of outpatient surgery and history of treatment in a pain clinic. Anxiety was assessed using a four-point verbal response scale with 0 = not anxious, 1 = a little anxious, 2 = moderately anxious and 3 = very anxious. Postoperative pain expectation was assessed using a four-point verbal response scale with 0 = no pain, 1 = a little pain, 2 = moderate pain and 3 = severe pain. Demographic data for each patient was collected.

Intraoperative data collected included the surgical procedure, the surgical service, type of anaesthetic (general, regional, monitored anaesthetic care) and intraoperative use of analgesics and local anaesthetic infiltration. Postoperative pain assessments were made using a four-point verbal response scale with 0 = no pain, 1 = mild pain, 2 = moderate pain requiring analgesics and 3 = severe pain unrelieved by analgesics. Pain assessments were made by postanesthesia care unit (PACU) nurses on patient arrival at the PACU and at discharge from the PACU. Patients were contacted the day following surgery by a PACU nurse and asked to rate their pain at the present time as well as their worst pain following discharge using the four-point verbal response scale. In addition, patients were asked if their pain had interfered with their ability to sleep or perform normal activities, if they had called the hospital or a physician because of pain and if they would have preferred to remain in the hospital in order to receive pain medication.

Spearman correlations, Wilcoxon rank sum test, Kruskal-Wallis rank analysis of variance and Fisher's exact test were used, where appropriate, to determine correlation between preoperative and intraoperative variables and outcome. Student's *t* tests and χ^2 analysis were used to determine differences between groups with and without moderate and severe pain and between groups experiencing pain-related outcomes. *P* values <0.01 were considered statistically significant.

Results

Of the 189 patients subject to data analysis, 127 (66.8%) were female and 63 (33.2%) were male. The mean age of the patients was 38.05 yr (range 18–82 yr). Distribution of preoperative anxiety and pain expectation ratings are presented in Table 1. Fifty-two patients (27.4%) were taking analgesics and 22 patients (11.6%) were taking psychoactive medications on a routine basis prior to surgery. Anaesthetic techniques utilized were general anaesthesia – 108 patients (57.2%), regional anaesthesia – 42 patients (22.2%) and monitored anaesthetic care – 39 patients (20.6%). Surgical services included orthopaedic surgery – 60 cases (31.7%), gynaecological surgery – 43 cases (22.8%), plastic surgery – 35 cases (18.5%), otorhinolaryngological surgery – 20 cases (10.6%), general surgery – 19 cases (10.1%), ophthalmological surgery – 10 cases (5.3%) and other – 2 cases (1.1%).

On arrival at the PACU most patients experienced either no (48.4%) or mild (20.7%) pain. On discharge

Table 1. Preoperative anxiety and pain expectations

	Total number (%) of patients			
	Score			
	0	1	2	3
Preop anxiety	27(14.3%)	64(33.9%)	58(30.7%)	40(21.2%)
Preop pain expectations	6 (3.2%)	69(36.5%)	97(51.3%)	17 (9.0%)

Table 2. Pain following discharge

	Total number (%) of patients			
	Score			
	0	1	2	3
Pain now	54(28.7%)	67(35.6%)	57(30.3%)	10 (5.3%)
Worst pain	11 (5.8%)	38(20.1%)	105(55.6%)	35(18.5%)

(Pain now = pain score at the time of the follow-up phone call. Worst pain = worst pain experienced following discharge).

from the PACU, the majority of patients had excellent pain control. However, nine patients (4.9%) were discharged with a pain score of 3 indicating severe pain. One patient was admitted for pain control. The majority of patients experienced moderate or severe pain following discharge. Pain scores following discharge are presented in Table 2. The frequency of pain-related outcomes was as follows: sleep disturbance secondary to pain – 61 patients (32.5%); activity disturbance secondary to pain – 64 patients (33.9%); called physician because of pain – 15 patients (7.9%) and would have preferred to stay overnight in the hospital in order to receive pain medication – 10 patients (5.3%).

The level of pain experienced by patients in the PACU was significantly correlated with the type of anaesthetic technique ($P < 0.0008$). Patients receiving monitored anaesthetic care experienced the least pain and patients receiving general anaesthesia experienced the most pain in the recovery room. There was no correlation between anaesthetic technique and pain reported following discharge. The level of the worst pain experienced following discharge was significantly correlated with preoperative anxiety scores ($P < 0.01$), preoperative pain expectation ($P < 0.01$) and marginally correlated with preoperative use of psychoactive medication.

With regard to pain-related outcomes, there was a significant correlation with the desire to remain in the hospital overnight and preoperative psychoactive medication use ($P < 0.001$) and preoperative analgesic use ($P < 0.006$). Postoperative sleep disturbance secondary to pain was significantly correlated with both preoperative anxiety level ($P < 0.001$) and preoperative analgesic use ($P < 0.001$). Although 45.5% of patients taking psychoactive medications experienced postoperative sleep disturbance vs 30.4% of patients who were not, this difference was not statistically significant ($P = 0.2$). Postoperative activity disturbance was significantly correlated with the location of surgery ($P < 0.0001$) with patients having surgical procedures involving the chest or abdomen reporting activity disturbances more fre-

quently than those patients undergoing surgical procedures involving the head or extremities.

Discussion

One of the most important findings of this study was the surprisingly high incidence of moderate and severe pain following ambulatory surgery, along with the high incidence of pain-related outcomes such as sleep and activity disturbance. We found that 74% of patients undergoing a wide variety of outpatient surgical procedures experienced moderate to severe pain at some time during the 24 h following discharge from the outpatient surgery facility. In addition, 32% of patients experienced difficulty sleeping because of pain and 34% of patients reported that pain interfered with their normal activity. Our findings are similar to those of Firth who conducted a postal survey of patients following ambulatory surgery and reported that 53% of patients experienced moderate to excruciating pain and 22% of patients had difficulty sleeping following outpatient surgery⁹.

The incidence of pain following outpatient surgery that we reported is also in close agreement with the incidence of moderate and severe pain reported both in medical inpatients¹ and surgical inpatients². Cohen reported that 75% of patients reported being in moderate or marked distress following inpatient abdominal surgery². The recognition of the high incidence of pain following inpatient surgery helped spur the development of more optimal techniques for postoperative analgesia, such as patient-controlled analgesia and the use of neuroaxial narcotics. This report of an almost identical incidence of moderate and severe pain following ambulatory surgery should heighten clinicians' awareness of this problem and encourage the development of more effective analgesia treatments for outpatients. As the number and complexity of procedures being performed on an outpatient basis continues to expand, it is likely that the incidence of pain following ambulatory surgery will grow as well unless effective strategies for the prevention and treatment of postoperative pain are developed and utilized.

Despite the fact that 18.5% of patients experienced severe pain following discharge, only 7.9% of patients called their physicians concerning pain. In addition, only 5.3% of patients stated that they would have preferred to remain in the hospital overnight in order to receive pain medication. These findings suggest that patients may be reluctant to contact their physician and prefer to recover at home despite experiencing significant pain. In a study of outpatients undergoing laparoscopy, Jamison reported that 97% of patients preferred to recover at home vs staying overnight in the hospital¹⁰.

The other important finding of our study was that clinicians may be able to identify patients preoperatively who are more likely to experience significant postoperative pain and pain-related outcomes. We expected that certain surgical procedures would be associated with a

greater incidence of moderate to severe postoperative pain. Although patients undergoing plastic surgical procedures had the highest incidence of moderate to severe pain following discharge (80%) and patients undergoing ophthalmological surgery had the lowest incidence of moderate to severe pain following discharge (50%) there was no statistically significant correlation between the type of procedure and pain experienced following discharge. It is likely that this study did not have a sufficient number of patients to demonstrate this correlation. However, we were able to identify several preoperative factors that correlated with the severity of postoperative pain following discharge. Patients who expressed high levels of anxiety or pain expectations preoperatively had higher pain scores following discharge. There was a significant correlation between preoperative anxiety and pain expectation ($P < 0.0004$). While it is possible that patients undergoing certain surgical procedures would have greater anxiety and pain expectations, there was no significant correlation between preoperative anxiety or pain expectation and type of surgical procedure. Lastly, patients taking psychoactive medications preoperatively experienced more pain postoperatively.

This relationship between preoperative anxiety, pain expectations and postoperative pain has been demonstrated in numerous studies. Parris demonstrated a positive correlation between preoperative anxiety ratings and postoperative pain ratings in women undergoing outpatient laparoscopy¹¹. In a study of women undergoing minor gynaecological surgery, Wallace reported that preoperative pain expectation was positively correlated with reported pain immediately following surgery¹². In addition, Liu reported that recent life stress affected recovery following surgery in terms of the degree of perceived pain and the presence of postoperative morbidity¹³.

Given the high incidence of pain following surgery, what can be done to ensure a more comfortable recovery? First, clinicians should be able to identify patients who have high levels of preoperative anxiety or significant pain expectations and target those patients for psychological support and education. Several studies have demonstrated that preoperative education can reduce patient anxiety¹⁴ and diminish the intensity of pain following surgery^{12,15}. Vallerand demonstrated that a group of patients undergoing third molar extraction who were given preoperative information regarding potential postoperative sequelae reported significantly less pain and greater satisfaction with pain control compared to a group of patients who were only given information regarding wound care¹⁵.

The strongest correlation with the level of pain reported following discharge was the intensity of pain at the time of discharge. Twenty-three per cent of patients rated their pain as moderate or severe at the time of discharge. Given the level of pain these patients were experiencing at the time of discharge, it is not surprising that these patients experienced more pain following discharge. Based on these results we believe that it is

imperative that patients who are in pain when otherwise ready for discharge should receive additional pain management in order to ensure that their pain is well controlled prior to discharge. The use of balanced analgesia with local anaesthetics, nonsteroidal anti-inflammatory drugs and opiates as well as psychological support and education may be useful in achieving this goal. Lastly, as analgesia following discharge typically is provided by the operating surgeon, perhaps education of our surgical colleagues regarding effective postoperative analgesia would improve patient comfort.

In summary, this study found a significant incidence of moderate and severe pain and pain-related outcomes following a wide variety of ambulatory surgical procedures. Patients' preoperative anxiety, pain expectations and pain intensity at discharge were positively correlated with the level of pain reported following discharge home. Given the high incidence of postoperative pain following ambulatory surgery, the negative psychological and physiological effects of pain and the growth in the types and numbers of outpatient surgical procedures, further efforts need to be made to develop effective strategies for the prevention and treatment of postoperative pain in the ambulatory surgery patient.

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Patients' opinions and experiences of ambulatory surgery – a self-care perspective

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Patients' opinions and experiences following ambulatory surgery for varicose veins, hallux valgus correction, inguinal hernia or arthroscopic knee surgery, were assessed from a self-care perspective. Almost all patients found it comfortable to be discharged the day of operation despite some discomfort and symptoms experienced at home. However, 9–32% of the patients lacked verbal and written postoperative information for self care about pain relief drugs, recommended and forbidden postoperative activities, care of the wound and personal hygiene. The need for verbal information and for getting questions answered by the physicians concerning the surgical procedure and complications before discharge was stressed by the patients.

Key words: Ambulatory surgery, patients' experience, postoperative self care, day surgery

Introduction

To an ever increasing extent more and more patients are operated on in an ambulatory surgery setting^{1,2}. The most common day-surgical procedures in Sweden are in gynaecology: vacuum termination, abortion, curettage, cervicectomy, laparoscopic sterilization and diagnostic laparoscopy, in orthopaedics: arthroscopy, carpal tunnel decompression, extraction of osteosynthetic materials and operations for epicondylitis and hallux valgus correction. In general surgery the most common operations are for varicose veins, inguinal hernia, biopsies and minor anal surgery¹. Day surgery is defined by the Swedish Planning and Rationalization Institute (SPRI) as surgery or other treatment of corresponding degree of difficulty which usually demands anaesthesia (local, regional, spinal, lumbar or general) and which includes a postoperative recovery period of 2–5 h before discharge.

As all day surgery patients are expected to take care of themselves with the help of relatives or spouses it is important that the nursing care and treatment aims to reduce or diminish postoperative complications and discomfort as much as possible. Therefore it is important that the anaesthesia used, the type of operation and the information provided are adapted for these circumstances and the patients' conditions, wishes and needs^{3,4}. Selection criteria used by physicians for day surgery are important to achieve the best outcome of treatment.

The goal is that the patient should have a good result from the operation and from the patient's perspective a satisfactory quality of treatment and nursing care. The ambulatory procedure should not lead to patients' readmission to hospital. In the SPRI report¹ the importance of adequate standards for the perioperative treatment and care are emphasized. Roberts⁵ claims that clinical indicators for quality assurance in ambulatory surgery are, for example, cancellations by patients and by the surgeon, return to the theatre, unplanned admissions to the hospital postoperatively and more than 6 h stay for the patient at the postanesthesia care unit (PACU).

The criteria for day surgery and discharge from hospital must be appropriate and be implemented. It is important in the care of patients that nurses have adequate and appropriate discharge criteria and also practise them⁶. According to White⁶ the patient must have had stable vital functions for more than 30 min and no new signs or symptoms should appear during the patient's stay in the PACU. Pain and other discomfort should be controllable with oral analgesics and acceptable to the patient. The nurse should check the patient's condition and functions and assure that the patient is not left alone at home. Johnson and Jarrett⁷ state that patients should not be discharged if general anaesthesia has lasted for more than 60 min and that patients should have assistance at home by an adult for the first 48 h after their operation. Furthermore the travelling time from the hospital to the patient's home should not be more than 1 h.

It is also important to investigate the patients' expectations as this could influence their satisfaction postoperatively⁸. Sarvimäki⁹ has also shown that patients

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find it difficult to give negative criticism. In spite of this, it became apparent that patients thought that the information given to them was defective.

Preoperative information was also seen to be important in order to prevent anxiety which could lead to cancellations¹. According to Swindale¹⁰ only 50–60% of the patients, who were worried and experienced anxiety, recalled the verbal information. Therefore it is important to reduce patients' anxiety and to give both verbal and written information which is both comprehensive and in layman's language. Information given postoperatively may be forgotten or not understood as patients are influenced by the anaesthetic agents for up to several hours after general anaesthesia^{11–14}.

Black¹⁵ has shown that patients are often dissatisfied with parking places at the hospital, information about how to take care of themselves after surgical procedures and having nothing to do in the ward while waiting for their surgery. In this study patients who were to undergo inguinal herniorrhaphy or varicose vein surgery were given written information concerning care of the wound, personal hygiene and forbidden and recommended activities when they were booked for operation. Patients who were to undergo arthroscopy or exostose-ectomy of the foot received such information postoperatively. However, the written information about analgesics was the same for all patients. Additionally, all patients were always given verbal information before discharge and they were also encouraged by the nurse to ask questions. Some patients also met the surgeon before discharge but this was not routine.

As inguinal herniorrhaphy, knee arthroscopy, hallux valgus and varicose vein surgery are among the most common day-surgery procedures it is important to evaluate the patients' experiences and opinions about the whole day-surgery procedure, including treatment and care during the stay at the hospital and the initial postoperative period at home. This knowledge is of importance in the evaluation of the discharge criteria and for the nurses' preparation of patients for self care at home. This means that patients' experienced pain should be controllable by oral analgesics, they should be oriented to time and space, have no or only mild nausea, no dizziness after movements or walking around and finally that the home situation should be satisfactory i.e. patients should be able to go home and be able to care for themselves. Therefore it is of importance to investigate the patients' experiences and opinions from a perspective where the whole ambulatory procedure is evaluated. The study should also contribute to an increased knowledge about the initial postoperative period so that postoperative information is relevant and appropriate in a self-care perspective.

Purpose

The purposes of the study were to:

- describe the opinions and experiences of patients

who had undergone arthroscopy, inguinal herniorrhaphy, varicose vein surgery or hallux valgus correction in an outpatient setting from a self-care perspective

- assess differences between the patients' experiences of discomfort, worry or anxiety before the anaesthesia and operation
- assess differences between the patients' experiences of the stay in the PACU and at home
- describe patients' opinions about verbal and written information including that received before the operation, during the day of operation and after surgery in conjunction with discharge.

Methods

A questionnaire consisting of 46 questions and one open question was designed by the authors. The following themes were explored: waiting time before the process started, accessibility for nurses and services, how patients were treated, expectations, anxiety, anaesthesia, postoperative discomfort and complications, self care in home, information and patients' opinions and experiences of care during their visit to the unit for ambulatory surgery. Seven questions concerning patients' experiences of anxiety about anaesthesia and surgery and experiences with the insertion of the intravenous (iv) needle and how they received regional, local and/or general anaesthesia (i.e. to be awake during surgery and/or to sleep) were explored using a visual analogue scale (VAS). The VAS consisted of a 9 cm horizontal line, which started with figure one and ended with figure ten. Instructions about how to mark the scale followed every question, i.e. the left of the line represented no experienced discomfort/anxiety at all to the right of the line which represented the most extreme discomfort/anxiety. The use of a VAS was considered the most sensitive way to measure the intensity of patients' experienced discomfort and/or anxiety, which is in agreement with Gift¹⁶. However, using this technique retrospectively might present a danger, especially for the elderly, in remembering previous experiences¹⁷. Therefore every question was followed by a line for comments.

Seven questions concerning accessibility, opinions about the length of waiting time before surgery, information about the causes for delays and polite treatment or not, consisted of 'yes' and 'no' answers. One question concerned how long the patient had to wait before the procedure started. Eleven questions concerned the environment in the ward, preparation and operation rooms, reception of sedative drugs, sleep quality during the operation, satisfaction with the anaesthesia given and expectations of recovery. These questions consisted of three alternatives i.e. 'yes', 'no' and 'don't know'. For two questions the possible answers were 'good', 'acceptable', 'not acceptable'. The occurrence of discomfort experienced in the PACU and at home and the treatment received was explored in accordance with the most common discomfort and symptoms from a previous

study¹⁸. Thirteen questions consisted of four different alternative answers i.e. 'very satisfactory', 'satisfactory', 'unsatisfactory' and 'very unsatisfactory'. These questions concerned the experienced quality of information and care, attention from the staff, experienced security and safety, the possibility and ability for self care and the overall impression of the care in the PACU. In the open question patients were encouraged to give their opinions about the whole procedure in their own words.

In order to validate the questionnaire five experienced registered PACU nurses and two physicians from the orthopaedic and general surgery departments examined its relevance and clarity. In a pilot study eight patients examined and answered the questionnaire. Two questions needed further clarification. Concerning the information question the patients stated that the quality of information received was different from physicians and nurses. Therefore this question was divided into two, one concerning information received from the physician and one concerning that from the nurses. The question about the operation clothes which the patients had to wear was also clarified. The validity and content of the questions were considered relevant in comparison with other studies using questionnaires about patients' experiences of outpatient surgery^{14,19}.

Statistics

Statistical methods used in this study were mean, standard deviation, confidence interval, χ^2 test such as Pearson and Fisher's exact test, Student's *t* test and analysis of variance (ANOVA).

Sample

In total 127 questionnaires were consecutively given postoperatively to patients who had undergone varicose vein surgery, hallux valgus correction, inguinal herniorrhaphy or arthroscopic knee surgery. Additional inclusion criteria were that the patients were able to understand Swedish and were 18 yr or older. The study was carried out at the County Hospital Ryhov in Jönköping, Sweden, during 7 months in 1994. Verbal and written information about the study and the questionnaire were given by one of the investigators when the patients arrived at the waiting room in the department of surgery.

Of the 127 questionnaires, 110 patients filled them in within 14 days and sent their questionnaires to the investigators. Of these, five patients were admitted to the hospital wards and are therefore not included in the study. Twenty-five patients had undergone varicose vein surgery and as many had been operated on for hallux valgus. Twenty-seven had undergone inguinal herniorrhaphy and 28 had undergone arthroscopic knee surgery. Patients' data are summarized in Table 1. Significantly more males than females were operated on for inguinal herniorrhaphy and arthroscopic knee surgery and more females than males had undergone surgery due to varicose veins and hallux valgus. There were also significant differences in average time spent in the recovery room between the four groups ($P < 0.001$, Table 1). The range of ages for all patients ($n = 105$) was 22–75 yr and the waiting time before surgery ranged from 0–150 min. The time spent in the PACU ranged from 95–570 min. There were significant differences in mean age and mean stay in minutes in the PACU between the patients in the four groups. Patients who had undergone arthroscopic knee surgery were on average younger than other patients ($P < 0.001$). Patients operated on for hallux valgus correction stayed on average a shorter time in the PACU than patients operated on for varicose veins and inguinal hernias ($P < 0.001$). Patients who had undergone inguinal herniorrhaphy needed to stay the longest time i.e. on average 302 min in the PACU.

Forty-one patients had received spinal anaesthesia. Significantly more patients operated on for varicose veins (44%) and inguinal hernias (41%) had received this type of anaesthesia than patients undergoing arthroscopic knee surgery (10%) and hallux valgus correction (5%). Twenty patients had received intravenous regional anaesthesia (IVRA) called Bier block, in the foot and all these were operated on for hallux valgus correction. General anaesthesia was given to 43 patients. More patients who had undergone arthroscopic knee surgery received general anaesthesia (56%, $n = 24$) than patients operated on for varicose veins (17%, $n = 7$), hallux valgus correction (4%, $n = 2$) and inguinal hernias (23%, $n = 10$, $P < 0.0001$).

Procedure

Just after their admission to the surgery department

Table 1. Patient data, mean age, waiting time before surgery and mean stay in the PACU ($n = 105$)

Procedure	Patients	Male/ female	Age (yr) mean (sd)	Waiting time (min) mean (sd)	Mean stay in PACU (min) (sd)
Varicose veins	25	10/15*	48 (11.39)	21 (33.91)	242 (69.86)
Hallux valgus	25	1/24*	53 (10.95)	25 (40.55)	200 (92.0)*
Herniorrhaphy	27	24/3*	54 (12.54)	19 (21.69)	302 (117.06)
Arthroscopy	28	19/9*	40 (12.62)*	27 (30.93)	211 (64.41)
Total	105	54/51	49 (13.02)	24 (32.22)	240 (92.6)

* $P < 0.001$

reception, patients were verbally informed and given written information about the study. The information was given before the patients were premedicated and before the preparation procedure had started. Postoperatively, just before discharge from the PACU the questionnaire was handed to the patient. The patients' decision about participation in the study was taken at home because it was important, from an ethical point of view, that the patients were not influenced by medication and were not forced to participate in the study. The questionnaires were returned, within 14 days of discharge, to the secretary of the postoperative and intensive care unit. Of 127 distributed questionnaires, 110 (87%) were returned. No reminders were sent out to the patients. The study was approved by the Ethical Committee, University Hospital in Linköping.

Results

About 75% of all patients ($n = 105$) had earlier experiences of surgery, but there was no significant difference between the patients in the different groups. All patients claimed that they had been treated politely by the staff in the waiting and preparation rooms. Eighty-two per cent of the patients stated that the staff had introduced themselves in the waiting and preparation rooms, while 13% did not know if the staff did so. All patients but one found the environment in the waiting room satisfactory but some of the patients thought that there ought to be some newspapers and magazines and something to look at, such as more pictures. Some patients also wanted to sit or lie down alone while waiting.

Waiting-time and choice of anaesthesia

On average patients had to wait 24 min (SD 32.22, range 0–150 min) before the procedure started. Fifty-nine patients had to wait up to 10 min, 24 waited 11–24 min and 18 waited more than 41 min. A majority of the patients (96%), who had had a waiting-time of more than 10 min stated that they were informed about the causes of the delay before the operation started. If the patients and relatives were informed about the reason for the delay a greater acceptance could be seen in the comments. Significantly more patients operated on for hallux valgus correction (57%) and for arthroscopic knee surgery (37%) stated that they were not offered a choice of different anaesthetic alternatives than those patients operated on for varicose veins (3%) and inguinal hernias (3%, $P < 0.0001$). More men (82% of 51) than women (58% of 50) stated that they were offered a choice of the type of anaesthesia ($P < 0.01$).

Nursing care safety and security

During their stay in the PACU 85% of the patients stated that they felt the nurses were very observant and 15% of the patients found the nurses observant for their condition and needs. All patients also stated that they

felt safe and secure during their stay in the PACU and that the nurses seemed to be skilled in their care.

Almost all patients (95%) found it comfortable to be discharged from the hospital on the same day as surgery. However, nine patients would have preferred to stay at the hospital one night after surgery. They stated that it was safer and more secure to stay at the hospital in case they bled from the wound, and they would receive pain relief. Some had experienced dizziness and nausea after discharge and stated that if they had been allowed to stay at the hospital they would not have needed to engage other persons to take care of them at home. A few patients said that if they had spent 1 or 2 days at the hospital they could have asked about their condition and got to learn about what was or was not normal. Of all patients four would have preferred to stay at a patient hotel if it had been possible and nine did not know. Three patients out of 101 found it bad and uncomfortable to take care of themselves at home.

Forty-two per cent of patients ($n = 101$) wanted to be phoned by the PACU nurse the first day at home. Significantly more patients, 45% ($n = 19$), who had undergone inguinal herniorrhaphy stated this compared to other patients operated on for varicose veins (22%), hallux valgus (14%) and arthroscopic knee surgery (19%, $P < 0.01$). Some patients commented that a telephone call was a good idea as they had forgotten what they had been told just before discharge and that a lot of questions might occur to them after the procedure.

Discomfort and anxiety prior to and in conjunction with anaesthesia and surgery

The average degree of anxiety and discomfort of the patients in the different groups are presented in Table 2. The degree of anxiety, measured by using the VAS, showed that for all patients ($n = 105$) the average degree of discomfort and anxiety before the operation was 2.80 (SD 2.17; CI 2.34–3.16) and before anaesthesia ($n = 104$) 2.54 (SD 1.98; CI 2.15–2.92). Of 104 patients who experienced the insertion of an iv needle, the average discomfort was mild (mean 2.28, SD 2.07; CI 1.83–2.61). About 39% of the patients reported that they had not experienced any discomfort, worry or anxiety before anaesthesia. Forty-six patients (44%) had experienced mild discomfort i.e. 2–5 on the VAS. Of the patients, 42% experienced mild discomfort, worry or anxiety prior to surgery and 37% experienced no discomfort or worry at all. When inserting the iv needle 54% of the patients stated that they had experienced no discomfort, worry or anxiety and 35% reported mild discomfort or worry.

Forty-one patients received spinal anaesthesia. Of these 18 were operated on for varicose veins, 17 for inguinal hernia, four for arthroscopy and two for hallux valgus correction. The average discomfort when receiving spinal anaesthesia was 2.58 (SD 2.26, median 2.00, range = 1–10) measured by VAS. Patients who received general anaesthesia ($n = 43$) experienced discomfort at a VAS average of 1.34 (SD 1.49, median 1.0) when they

Table 2. Mean value, standard deviation (SD), median (Md) and range (r) of patients' reported discomforts and/or anxiety prior to anaesthesia and surgery and in conjunction with insertion of the needle expressed on a visual analogue scale (VAS) and the different diagnosis groups

<i>Discomfort and anxiety prior to or in conjunction with</i>	<i>Varicose veins VAS mean (SD) Md, range</i>	<i>Hallux valgus VAS mean (SD) Md, range</i>	<i>Herniorrhaphy VAS mean (SD) Md, range</i>	<i>Arthroscopy VAS mean (SD) Md, range</i>
Prior to anaesthesia (n = 104)	3.0 (1.71) Md 3.0 r = 1-8	2.0 (1.47) Md 1.0 r = 1-6	2.85 (2.64) Md 2.0 r = 1-10	2.29 (1.76) Md 2.0 r = 1-8
Prior to surgery (n = 105)	2.76 (2.05) Md 2.0 r = 1-8	2.88 (2.44) Md 2.0 r = 1-10	3.15 (2.25) Md 3.0 r = 1-10	2.43 (1.99) Md 2.0 r = 1-8
Inserting iv needle (n = 104)	2.40 (1.41) Md 2.0 r = 1-6	2.56 (2.77) Md 1.0 r = 1-9	1.78 (1.45) Md 1.0 r = 1-7	2.39 (2.36) Md 1.5 r = 1-10

were going to sleep. Of two patients operated on for hallux valgus, who received general anaesthesia one recorded 10 on the VAS. This patient had received propofol.

Pain and discomfort during the PACU stay

Seventy-one patients (67%) experienced various problems during their PACU stay. Of these, 46 patients had one problem, 20 had two, four had three and one patient had five. The most common problem was pain from the wound (n = 50) and dizziness (n = 16; Table 3). Of the 50 patients who had experienced pain while staying in the PACU, four did not receive any treatment. Two of these patients did not want analgesics. Seven patients out of nine who experienced nausea did not receive any treatment for this. Two of these patients did not want any help, because the nausea was mild and soon disappeared. Of 16 patients who experienced dizziness, 11 did not get any help and two of these did not want any treatment. Of the seven patients who had headaches, four did not receive any treatment and one of these did not want analgesics. Ten patients experienced problems with urination while staying in the PACU and three of them did not receive any treatment. Almost all patients, 10 out of 11 with other complications, such as feeling frozen, bleeding and problems

with bandaging reported that they received help in the PACU.

Written information and pain and complications at home

Fifty-five patients (52%) experienced complications at home, the most common of which was pain (n = 46; Table 4). Of the patients (n = 55), 33 experienced one complication, 13 two, seven three and two four. Significantly more patients operated on for hallux valgus and inguinal hernias reported pain at home than the other patients (P < 0.05). Some patients commented by this question that their pain had been very severe and stated that paracetamol was not sufficient. One patient had pain for several days but this continuously declined. No patients reported difficulties with urination or wound infections. As can be seen in Table 5, 9% of the patients stated that they did not get any information on what to do or who to contact if they got symptoms they did not know about. Significantly more inguinal herniorrhaphy patients (30%) stated that they got such information compared to patients who had undergone arthroscopic knee surgery (22%, P < 0.05). Twenty patients did not get information about recommended activities and how to take care of personal hygiene during the recovery period.

Table 3. Patients' reported pain and discomfort during their stay in the PACU (n = 71)

<i>Procedure</i>	<i>Pain from wound n = 50</i>	<i>Nausea n = 9</i>	<i>Dizziness n = 16</i>	<i>Headache n = 7</i>	<i>Problems urinating n = 10</i>	<i>Other n = 11</i>
Varicose veins	15	1	3	1	3	4
Hallux valgus	14	2	4	1	2	3
Herniorrhaphy	13	4	1	1	4	0
Arthroscopy	8	2	8	4	1	4

Some patients reported more than one discomfort.

Table 4. Patients' reported pain and discomfort experienced at home ($n = 55$)

<i>Procedure</i>	<i>Pain</i> $n = 46$	<i>Nausea</i> $n = 12$	<i>Difficulties sleeping</i> $n = 16$	<i>Problems with bandage</i> $n = 9$	<i>Anxiety</i> $n = 3$	<i>Bleeding</i> $n = 2$
Varicose veins	9	1	5	4	1	0
Hallux valgus	16	6	4	2	1	2
Herniorrhaphy	15	2	4	2	1	0
Arthroscopy	6*	3	3	1	0	0

* $P < 0.05$.

Some patients reported more than one discomfort.

Table 5. Patients from different diagnostic groups who reported that they had received verbal information about who to turn to if they got postoperative complications, analgesics, how to take care of the wound, what activities which should be avoided and how to perform personal hygiene ($n = 105$)

<i>Procedure</i>	<i>Where to turn for information</i> $n = 91$ (%)	<i>Analgesics</i> $n = 98$ (%)	<i>Wound care</i> $n = 93$ (%)	<i>Activities</i> $n = 85$ (%)	<i>Personal hygiene</i> $n = 85$ (%)
Varicose veins	22 (24)	22 (21)	23 (25)	22 (26)	21 (25)
Hallux valgus	22 (24)	24 (25)	21 (22)	15 (18)	16 (19)
Herniorrhaphy	27 (30)	25 (26)	23 (25)	23 (27)	23 (27)
Arthroscopy	20 (22)*	27 (28)	26 (28)	25 (29)	25 (29)

* $P < 0.05$.

Twenty-four per cent of patients did not receive any written information about pain relief drugs. More patients (29%) who had undergone inguinal herniorrhaphy reported that they had got such information compared to patients operated on for varicose veins (19%, $P < 0.05$). Of the patients who had received written information about personal hygiene ($n = 71$), more patients who had undergone arthroscopic knee surgery (35%) reported such information compared to patients operated for hallux valgus correction (16%). There was no significant difference between the four groups concerning the information received about how to take care of the wound. Thirty-two patients did not receive any information at all about this.

Information and contact with physicians and nurses

About 14% of the patients stated that the information received from the physician before the procedure was bad or insufficient and 4% of the patients found the information given by the nurses bad or insufficient (Figure 1). Information received from the physician on the day of operation was regarded as bad or insufficient by 19% of the patients. The corresponding figure for information given by the nurses was 4%. After the procedure 36% of the patients stated that the information given by the physicians was bad and 5% of the patients claimed that the information given by the nurses was bad. There was no significant difference between the groups of patients. Some patients commented that it was unsatisfactory not to meet the surgeon before the operation and that information given postoperatively

was not remembered as the surgeon informed the patient when they were not fully awake and alert. Some patients did not meet the surgeon at all; not before the operation, during the stay in the PACU or before discharge. This upset some patients and they found this practice surprising and very bad. Most patients commented about this lack of contact with the physician and stated that a meeting, especially with the surgeon, is absolutely necessary. One patient found the surgeon stressed and just running in and out with no time for the patient at all. Some patients stated that they only met the anaesthetist whose information was very good. Further, patients wanted more information other than just "hello" from the physician! Theatre room nurses were also mentioned by the patients as not being informative as they only introduced themselves. Patients who had undergone procedures such as hallux valgus correction and inguinal herniorrhaphy wanted to receive information postoperatively about the surgery, in particular that all was found normal. Patients who had undergone arthroscopic knee surgery wanted to talk to the surgeon about the causes of their discomfort, the adequacy of the knee, when they could return to normal activity and work, which activities were allowed and their expected condition during the first postoperative week.

Discussion

It is known that patients, on the subject of treatment and care, experience difficulties in giving negative criticism about the care they receive⁹. In order to facilitate

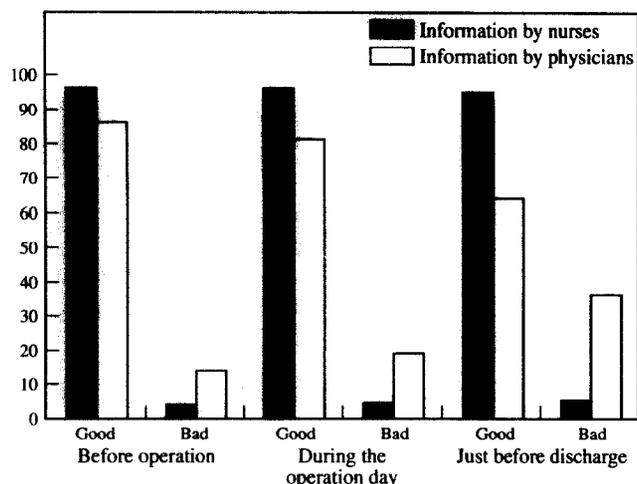


Figure 1. Patients' impressions in percentages of the information given by nurses (■) and physicians (□) before operation, on the day of operation and just before discharge ($n = 105$).

this the patients were given the opportunity to evaluate the care they received during day surgery by completing a questionnaire within 14 days after discharge from the PACU. As it was found in a previous study that patients, operated on for inguinal hernia, had a lot of questions and points of view¹⁸, the questionnaire was constructed to include semistructured questions and at the end an open-ended question. The questions in the questionnaire are in accordance with other previous studies^{1,14,15,18,19} and can therefore be determined as relevant. However, the results must be interpreted with caution as patients answered the questionnaire within 14 days after the operation. Some might have answered the questionnaire rather soon postoperatively, but there might also be patients whose recollection of the events, experienced discomfort, anxiety and circumstances might have deteriorated. Their opinions and feelings may also be influenced by the recovery process so that positive progress could lead to positive answers and negative progress the opposite. This has been pointed out by Carmel²⁰. Sixteen patients did not send in the questionnaire. Some of them might have been admitted to the hospital later on and therefore did not find the questionnaire relevant.

Patients who had to wait a longer time before they were prepared prior to anaesthesia and surgery seemed to accept the delay when they were informed about the reasons. Therefore it is important that the nurses and reception staff tell the patients and relatives as soon as possible about the reasons for any delay, so that patients experience consideration and do not think that they are forgotten. Patients who were operated for hallux valgus correction or had undergone arthroscopy reported less choice in the type of anaesthesia, which reflected the routines of anaesthesia, i.e. intravenous regional anaesthesia (IVRA) for hallux valgus operations and general anaesthesia for arthroscopy.

Even if the majority of patients found it convenient to have ambulatory surgery, some would have preferred to stay at the hospital for one night after surgery. These

patients may have experienced severe worry or anxiety before the procedure or may have experienced limited ability to take care of themselves at home. Lack of information or non-personalized information could also have contributed to the patients' experienced insecurity. A telephone follow-up by the nurse was wanted primarily by patients who had undergone inguinal herniorrhaphy, which is in accordance with a previous study¹⁸.

All patients were offered sedation before anaesthesia and surgery and almost everybody received this. Most of the patients reported mild discomfort, worry and/or anxiety prior to anaesthesia and surgery in conjunction with insertion of the iv needle. In the study by Gupta et al.¹⁴ 62% of the patients felt anxiety preoperatively. Information from a nurse and the opportunity for patients to ask questions at the time the decision for surgery is made, followed by a presurgical telephone call by a nurse the day before surgery was found by Kempe and Gelazis⁴ to be the most effective way to reduce anxiety. Furthermore, the information given to patients must be adjusted to the individual patient's needs, which has been emphasized by Swindale¹⁰.

Patients undergoing inguinal herniorrhaphy spent more time in the PACU than the other patients, which was caused by a longer observation period due to the risk of bleeding. Another reason is that some of these patients had received spinal anaesthesia and before discharge the anaesthesia must have disappeared completely and the patients should be able to walk around without discomfort. Additionally, these patients had to be able to urinate before discharge. No patient had had difficulties urinating at home, which shows that the discharge criteria were followed by the nurses.

As some patients reported severe pain at home and the peroral analgesics given to the patient for home self care were not sufficient, a prescription for stronger analgesics may be given to patients for use if needed. The written and verbal information given before discharge ought to include information about the continuously decreasing effect of bupivacaine which may result in a temporary increase in pain. The patient needs to know how to prevent this pain in time. Patients with severe pain are, according to the discharge criteria, not allowed to go home. According to White⁶ pain experienced postoperatively, treated by peroral analgesics, should be acceptable to the patient before discharge. Some patients also reported headaches postoperatively and some of these stated that they did not get help to relieve that pain. It might be that the patients perceived that no special drug was given to them for headaches and that the nurse did not tell the patient that their analgesic drug would have an effect on both wound pain and headache. But it is also possible that the nurses did not ask about pain other than wound pain.

Dizziness, nausea and vomiting may appear after surgery²¹, especially if the patient has been operated on later in the day and therefore has been without food and fluid for a longer time. The incidence of postoperative nausea and vomiting in women may also be influenced by the day of the menstrual cycle²², but

information about this was not included in this study. Some patients stated that they did not get help for their dizziness and nausea during their stay in the PACU. Probably the nurses had not informed the patients about the effect of their interventions such as infusions and iv drugs. It is also of great importance for the nurse and the anaesthetist to get information preoperatively about patients' previously experienced postoperative problems. This knowledge makes the physician and the nurse more prepared to prevent these kinds of problems³. Since 52% of patients experienced pain and discomfort at home, further studies are needed, as there is a lack of knowledge about the duration and intensity of pain and other complications. Additionally follow-up studies are needed about patients' subjective opinions and experiences of the recovery period, i.e. when they found they could start work again, when they could return to their normal life and felt recovered.

It was found that 9% of patients did not get any information or could not recall that they had had information about what to do or who to contact if they got symptoms at home that they could not handle or did not have knowledge about. Furthermore the study revealed that patients did not get sufficient information about self care or were unable to remember the information. The patients' opinions about the written information showed that not all patients received such information or that the information was insufficient from a self-care perspective. Therefore it is, first of all, necessary that the written information should be relevant and appropriate according to the surgical procedure from a self-care perspective. To make this possible all staff involved must collaborate and include their knowledge about patients' experiences of self care after ambulatory surgery. Second, the written information has to be given to the patients, preferably when the operation day is decided and the day before surgery⁴.

Some patients also expressed dissatisfaction with the information given by the physicians. They also wanted to meet the surgeon prior to the procedure and after the operation. From a patient's perspective this is of importance as the patients are responsible for their own care at home and indirectly for the result of the surgery, i.e. their contribution to a successful procedure. Patients, especially those who undergo inguinal herniorrhaphy, also need to be assured that the operation did not reveal any severe disease. This information may contribute to a safer and more secure patient and successful care at home, which is one of the criteria for ambulatory surgery.

Conclusion

Almost all patients found ambulatory surgery convenient, but the patients' experiences also revealed that further measures must be considered to increase the patients feelings of postoperative security and improve self care at home. Written and verbal information before discharge revealed limitations concerning who to

contact if they experienced severe symptoms or complications, which exercise or activities were recommended or forbidden, how to take care of personal hygiene, pain relief drugs and pain management. Even if the majority of patients were satisfied with the information given by the physicians and nurses prior to anaesthesia and surgery, in the PACU and just before the discharge from the PACU, some were disappointed and expressed a need for a meeting before discharge, for information, questioning and follow-up with the physician, especially the surgeon.

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Admissions following ambulatory surgery: outcome in seven urban hospitals

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A retrospective review of ambulatory surgery admissions during a 12-month period was undertaken in seven hospital-based ambulatory surgery units to identify variables that contributed to hospital admissions and to make recommendations to reduce avoidable admissions further. Out of 32 457 ambulatory surgery patients, 3.2% were admitted (1042), with a range of 0.9–9.4% across the seven hospitals. When controlling for hospital differences, urological surgery had the highest admission rate (6.1%) compared to other surgical specialities and emerged as a significant predictor of hospital admission ($P < 0.001$, odds ratio 3.9, 95% confidence interval (CI) 3.28–4.56). Both regional and general anaesthesia were significant predictors of admission and had proportionally higher admission rates (4.7 and 4.2% respectively, $P < 0.05$) compared to monitored anaesthesia care (MAC) and local anaesthesia (1.3 and 0.6% respectively, $P < 0.05$). Admission rate was the same for ASA I–III patients. Admissions were regrouped into unavoidable reasons – 58%, potentially avoidable admissions – 23% and avoidable – 16%. Main predictors of avoidable admission were duration of surgery ($P < 0.001$) and female gender ($P < 0.037$). As close to 40% of admissions may be avoidable, efforts toward their reduction should be directed at scheduling cases that are reasonably likely to require extensive surgery on an inpatient or less than 24 h observation basis, and by prioritizing outpatient cases in an integrated operating suite.

Key words: Ambulatory surgery, outcome, continuous quality improvement, hospital admissions

Introduction

As more extensive procedures are performed on an outpatient basis and patients with complex medical problems are considered for ambulatory surgery, management of surgical outpatients should be guided by indicators of outcome and safety^{1,2}. Hospital admissions following ambulatory surgery have been used as an important index of outcome. A number of studies both in the US and abroad describe hospital admission rates of 0.09–16%^{7–22}. However, variability in reporting mechanisms confounds inferences about outcome. Because previous studies are limited to reports of data from individual facilities, we undertook a multi-centred study in

order to report data on a large group of patients over a relatively short time frame. Additionally, previous studies did not attempt to analyse the impact of avoiding admissions. Therefore, the purpose of this investigation was not only to determine the prevalence of post-ambulatory surgery admissions but also to analyse associated causes and contributing factors so that recommendations to further their reduction could be made and to provide a focus for future research.

Methods

Data

Seven hospital-based ambulatory surgical units in the New York Metropolitan area participated in this study. Data were collected from each hospital for the 12-month period from 1 January to 31 December 1991. Hospital medical records, ongoing quality improve-

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ment, and operating room databases were reviewed by the anaesthesiologist from each facility participating in the retrospective review. Each hospital submitted summarized data. Admissions following ambulatory surgery were coded according to the following: reason for admission, anaesthesia type, patient age, gender, American Society of Anesthesiologists' (ASA) physical status classification, surgical service, duration of surgery and length of hospital stay.

Hospital admission was defined as any patient who was not discharged directly from the Ambulatory Surgery Unit (ASU) on the day of surgery. Admissions were divided into medical and non-medical by the following categories (Table 1): Surgical: 1. extensive surgery (not related to complications), 2. bleeding and/or observation for bleeding (not considered under complications), 3. temperature elevation, infection and/or need for intravenous antibiotics, 4. surgical complications at the time of initial surgery (i.e. vascular injury, uterine perforation), 5. additional procedure to be scheduled (i.e. breast biopsy leading to mastectomy), 6. return to the operating room the same day (i.e. bleeding tonsils); Combination of surgical and anaesthetic: 7. nausea and vomiting, 8. pain, 9. urinary retention; Medical: 10. medical observation and/or medical treatment for pre-existing or new onset non-surgical condition; Anaesthetic: 11. anaesthesia complication (difficult intubation, airway complication not related to surgery, suspected aspiration pneumonia), 12. prolonged recovery from anaesthesia (>2 h in PACU); Administrative/social: 13. inappropriately booked procedure (including procedures with high probability of more extensive surgery, i.e. laparoscopy with a possible laparotomy, or arthroscopy with a possible reconstruction), 14. late start in the operating room, 15. no escort, 16. inadequate home support and 17. a Miscellaneous category (reasons either unknown or do not clearly fit into listed category). Reasons for admission were regrouped into three broad categories for purposes of post-hoc recommendations: unavoidable (surgical, medical and anaesthesia complications); potentially avoidable (combination surgical and anaesthetic causes, prolonged anaesthesia recovery); and avoidable admissions (administrative/social). Case data on the avoidable vs. unavoidable admissions were available from three hospitals and were analysed separately.

The seven participating hospitals reflect the broad composition of the integrated ASUs in the Metropolitan New York area. Hospital 1 is a municipal hospital with a predominantly indigent population. Its ASU included late second trimester abortions and excludes paediatric surgery. Hospitals 2, 5 and 6 are tertiary, nonprofit, primary affiliates of medical schools. Hospital 2 excluded paediatric and ophthalmic surgery. Hospitals 3 and 7 are university-affiliated community hospitals. Hospital 4 is a tertiary referral nonprofit university-affiliated cancer centre which excludes ophthalmological and dental cases. It was the only participating hospital with ambulatory operating room suites physically separate from the main operating room. All ASUs

except hospital 4 have residency training programmes. Five out of seven hospitals are trauma centres.

Statistical analysis

Data were analysed by χ^2 and multiple logistic regression analysis. Two sets of logistic regression analyses were conducted: The first analysis was conducted to identify predictors of admission in the data on the general ambulatory surgery population, while controlling for differences among hospitals. Variables included surgical service, anaesthesia type and ASA status. The second analysis was conducted on the available case data of only the admitted patients from hospitals 1, 3 and 7, to identify predictors of avoidable admissions. The dependent variable was the category for admission (avoidable or unavoidable). Independent variables included hospital, surgical service, anaesthesia, ASA status, age, gender, duration of surgery and length of stay. The logistic regression entered these variables as main effects as well as two way interaction terms using a forward selection procedure. For all tests, $P < 0.05$ was considered to be significant.

Results

During the 12-month study period 32 457 patients underwent ambulatory surgery in the seven participating hospitals. Of these, 1042 patients were admitted, resulting in an overall admission rate of 3.2%. Interhospital variation and reasons for admission are shown in Table 1. Hospital 1 had the highest admission rate at 9.4% and hospital 4 the lowest at 0.9%. Separate multiple logistic regression analysis for each of the main variables, controlling for hospital differences, identified six significant risk factors for whether a patient could be admitted or not: patients who underwent urological procedures, patients who received general or regional anaesthesia, and ASA I-III patients were more likely to be admitted after ASU than other categories. Odds ratios and their 95% confidence intervals for selected factors, as well as admission rates are presented in Table 2.

Distribution of admissions by category was as follows: unavoidable 58% (surgical, medical and anaesthesia complications), potentially avoidable 23% (combination surgical anaesthetic, prolonged anaesthesia recovery), and avoidable admissions 16% (administrative/social). The most frequent unavoidable reasons were extensive surgery (16.2%) and bleeding (12.4%), with interhospital variation (Table 1). Continued medical observation and medical treatment were the reasons for 10% of admissions. These included arrhythmias, chest pain, suspected myocardial infarction, pulmonary oedema, hypertension and bronchospasm. Only one mortality was reported, which occurred on the fourth postoperative day and was due to a pre-existing medical condition. Unavoidable anaesthetic reasons constituted 8.7% of all admissions and were classified into

Table 1 Frequency and reasons for admission (in %)

Hospitals	1	2	3	4	5	6	7	Total
Admissions	120	144	103	23	216	278	158	1042
Total cases (%)	1280	4202	5049	2605	8549	7763	3009	32 457
	9.4*	3.4	2.0	0.9*	2.5	3.6	5.3 [†]	3.2
Surgical								44.8
1 Extended surgery	26.7	8.3	20.4	4.4	10.2	16.2	17.1	16.2 [‡]
2 Bleeding	5.8	18.1	9.7	17.2	15.3	9.7	10.1	12.4
3 iv Antibiotics	14.2	5.6	5.8	4.4	6.9	9.7	2.5	7.9 [‡]
4 Surgical complications	0.8	6.3	3.9	13.0	4.2	7.9	4.4	5.6 [‡]
5 2nd procedure scheduled	2.5	2.8	4.9	4.4	1.9	1.1	1.9	2.3
6 Return to or	0	0	1.9	4.4	0.5	0	0	0.4 [‡]
Combination surgical and anaesthetic								18.2
7 Nausea and vomiting	2.5	3.5	2.9	0	9.7	4.3	15.2	6.9 [‡]
8 Pain	5	6.3	9.7	0	6.0	7.9	4.4	6.8
9 No void	1.7	3.5	8.7	8.7	2.3	4.3	5.7	4.5
Administrative								13.7
10 Not ambulatory procedure	3.3	13.2	12.6	13	4.2	7.2	1.9	7.2 [‡]
11 Late or	15.8	2.1	1	13	1.4	5.0	13.3	6.5 [‡]
Medical								10.0
12 Medical observation	10	7.6	9.7	8.7	10.7	10.4	7.6	10.0
Anaesthetic								8.7
13 Anaesthesia complication	4.2	2.1	4.9	4.4	2.8	3.2	3.2	3.4
14 Prolonged anaesthesia recovery	1.7	11.1	2.9	0	4.2	5.0	5.1	5.3 [‡]
Social								2.5
15 No escort	0.8	2.8	1	0	2.3	1.1	4.4	2.1
16 No home support	0	0	0	0	1.4	0	0.6	0.4
Miscellaneous								2.1
17 Others	5	6.9	0	4.4	0	0	2.5	2.1

*Hospitals 1, 4 different from others ($P < 0.05$).[†]Hospital 7 different from hospital 2, 3, 5, 6 ($P < 0.05$).[‡]Interhospital variation ($P < 0.05$).**Table 2** Predictors of hospital admission

Variable	Rate%	P value	Odds ratio (95% confidence interval)
Urology	6.1	<0.001	3.86 (3.28–4.56)
ASA I	2.8	0.022	1.37 (1.04–1.80)
ASA II	2.7	<0.001	1.65 (1.26–2.18)
ASA III	2.8	0.019	1.41 (1.05–1.89)
General anaesthesia	4.2	<0.001	2.65 (2.27–3.10)
Regional anaesthesia	4.7	<0.001	2.47 (1.60–3.07)

complications (3.4%) and prolonged recovery (5.3%). Anaesthetic complications (3.4%) included airway complications and suspected aspiration pneumonia. Only two patients were admitted for suspected aspiration pneumonia. Interrelated surgical and anaesthesia factors included nausea and vomiting (N/V) in 6.9%, pain in 6.8% and inability to void in 4.5% of patients. These were considered potentially avoidable. Administrative/social and non-medical reasons (16%) were considered avoidable admissions and included cases for which the probability of more extensive surgery should have precluded ambulatory surgery (7.2%), cases which had a

late start in the operating room (6.5%), patients with no escort (2.1%) and no home support (0.4%).

Results of the stepwise multivariate logistic regression analysis and χ^2 s in 396 surgical cases (from hospitals 1, 3 and 7) identified the following three variables as predictors of avoidable admissions: duration of surgery, i.e. longer procedures resulted in more avoidable admissions ($P < 0.001$); female patients had more avoidable admissions ($P 0.037$ odds ratio 1.53, with a 95% confidence interval (CI) of 1.02–2.29) and the interaction of ophthalmology and/or plastic surgery with longer duration of surgery led to more avoidable admissions ($P 0.021$). Anaesthesia type, ASA status, age, surgical service and all other interactions among the independent variables did not emerge as significant predictors of avoidable admissions. The surgical procedures that were most frequently admitted, their distribution by anaesthesia type, ASA classification, mean age and length of hospital admission are shown in Table 3. Average age for the admitted population was 44.8 ± 22.28 yr and average length of stay (LOS) after admission was 1.8 ± 2.92 days. Based on available case-specific data of the admitted patients, 62% had a LOS less than 24 h, and admissions were largely for administrative/social reasons and for patients for whom a somewhat prolonged observation period was prudent.

Table 3 Clinical characteristics by surgical procedures

Surgical procedure (n)	Anaesthesia type			ASA type			Mean age (yr)	Mean LOS (days)
	GA	MAC	REG	I	II	III		
Laparoscopy and/or hysteroscopy (64)	64	0	0	46	17	1	31.64 ± 9.2	2.23 ± 1.7
Hernia repair (49)	36	4	9	23	19	7	47.12 ± 21.1	1.76 ± 1.48
Sinus surgery (19)	17	2	0	12	5	2	39.78 ± 17.2	1.42 ± 0.96
D&E (19)	18	0	1	11	6	2	23.47 ± 5.7	2.26 ± 1.8
Breast biopsy (14)	11	2	1	3	5	6	54.35 ± 15.3	4.85 ± 7.1
Haemorrhoidectomy (15)	3	6	6	6	4	5	48.2 ± 18.8	1.60 ± 1.2
Lithotripsy (12)	7	4	1	3	8	1	51.66 ± 19.3	3.1 ± 4.2
Cystoscopy (9)	5	1	3	1	4	4	59.33 ± 16.1	2.44 ± 2.2

Discussion

This study was undertaken not only to determine the prevalence of admissions after ambulatory surgery in a diverse set of metropolitan hospitals but also to identify variables to reduce avoidable admissions further, an aspect that previous outcome studies have not considered. As admission represents an undesirable outcome even if it does not result in increased morbidity or mortality, we sought to examine its causes and evaluate patient and medical speciality characteristics as risk factors. Admissions can be evaluated for utilization by two distinct aspects of patient care: quality control of medical and surgical services, and administrative organization. Although the need to hospitalize a patient after ambulatory surgery is often justified and unpredictable, the ability to keep avoidable admissions to a minimum would result in better utilization of ambulatory surgical and hospital inpatient services.

Studies in the US^{4,12}, Canada^{13-15,22}, Europe¹⁶⁻¹⁹ and Australia^{20,21} report a rate of admission ranging from 0.09-16%. The diverse nature of the hospitals in our study and the inclusion of more extensive procedures performed on an ambulatory basis in recent years may have contributed to the higher average admission rate (3.2%) than previously quoted for other hospital based units⁹. Our multi-centred study enables us to draw inferences about reasons for admissions from a large group of patients during a short time frame (12 months). Due to the multi-centred nature of this study, room for discrepancy with regard to categorization of the reasons for admission also exists. A few studies^{9,18,22} have identified factors that predicted hospital admission. Unlike previous reports, we identified urology (GU) as the only surgical speciality that had a four times greater risk for admission. GU had the highest rate of admission primarily following cystoscopy and transurethral resection of bladder tumours (TURBT) and lithotripsy-related procedures because of extensive surgery and haematuria requiring catheter insertion and further observation. As this finding was independent of the type of anaesthesia administered, surgical procedures remain the stronger determinant of admission. While these GU procedures may be standard for an ASU, we suggest that these pro-

cedures be postoperatively admitted to a <24-h observation unit or booked as inpatient admissions.

Our study differed not only in the variables that could predict admission, but also in the analysis of the actual admissions and whether they could be avoided or not. By categorizing admissions as either avoidable or unavoidable, it becomes less important whether they are grouped as either surgical, anaesthetic, or combined surgical and anaesthesia. Therefore, analysis of case data was undertaken to explore some of the relationships observed on the larger population and to identify predictors of whether the admissions were avoidable or not. Accordingly, corrective measures could be taken to reduce the avoidable category further. Duration of surgery, independent of patient or anaesthesia characteristics was identified as a predictor of avoidable admissions. Although no one surgical speciality was singled out in this analysis, procedures such as laparoscopy with a possible laparotomy or arthroscopy with possible reconstruction, are often inappropriately booked as ambulatory procedures. A database of procedure-specific operating times including surgeon profiles, together with administrative processes that actively review and trend admission rates, would assist hospitals in developing guidelines for scheduling these cases or in modifying physician practice patterns. Such evaluations can also be incorporated into quality assessment and improvement programmes². Hospital 1, a very active level 1 trauma centre, had many of its ambulatory cases postponed, causing late starts in the OR. This impacted negatively for the more extensive procedures, resulting in high admission rates. Prioritizing ambulatory cases based on anticipated length of procedure or anaesthesia recovery time, and ideally, providing dedicated ambulatory staff and facilities, is indicated in such settings. The tendency for female patients to be admitted for avoidable reasons most likely relates to the type of surgical procedure, although we could not find other significant interactions. The data further suggests that in integrated hospital ambulatory surgery facilities, better surgical anticipation of the extent of the procedure would result in more appropriate scheduling of procedures. We do not suggest that patients that were admitted should have been discharged instead, rather that within a

hospital-based integrated ASU there is a laxity in scheduling cases, assuming that an integrated facility could easily accommodate ambulatory admissions, if required. Guidelines for ambulatory surgery must be not only cost-effective, but synchronous with quality patient care. Admissions to inpatient beds are disruptive to hospital operations because they frequently postpone scheduled elective admissions and require a number of beds to remain vacant in their anticipation. Furthermore, utilization of nursing personnel and other hospital resources is not cost-effective when minimal patient care is required. This reinforces the need for the establishment of either a distinct <24-h observation unit or extension of nursing coverage to 24 h per day in ambulatory surgery recovery areas. The required nurse/patient ratio can be less stringent in this unit and physician coverage might be provided by the anaesthesia department which is available for emergency surgery. Improved preoperative diagnosis and planning could be remedial in cases where this probability is inherently higher. Further studies focusing on interventions in those areas that are avoidable or potentially avoidable hold promise for reducing unanticipated admissions after ambulatory surgery.

Although patients receiving regional and general anaesthesia had higher admission rates than those receiving MAC and local, anaesthesia type did not independently predict avoidable admissions. Therefore, selection of anaesthesia should be based on factors other than the desire to avoid hospital admission. Admission is more likely a factor of longer and more extensive surgery – a stronger determinant of avoidable hospital admissions than anaesthesia type. Nausea and vomiting have been regarded as common complications following adult^{3,9,15} and paediatric^{8,19} outpatient surgery, but were the cause of admission in less than 7% of cases in our study, compared to a much higher incidence in earlier studies^{5,7,9}. Our observed rate of admission for N/V and pain probably reflects the evolution of ultra-short anaesthetics and newer analgesic modalities that have reduced drowsiness and vomiting and provide better pain control. Comorbid condition, as identified by the ASA classification and age, did not appear to be a risk factor for admission. Contrasted to other studies, where the high admission rate was related to older patients with co-existing diseases^{17,20}, in our study, ASA III patients had no higher rate of admission than ASA I and II. This again supports our findings that surgical factors are more accurate predictors of admissions. All the facilities participating in our study had some form of preoperative screening, and should have been able to filter out the medically inappropriate patients thus reflecting the stable ASA III and IV patients. We suggest that with continued preoperative screening, admissions for unexpected medical problems or because of anaesthesia-related reasons will remain infrequent. Other factors, such as physician practice patterns may influence avoidable admissions and warrant further evaluation.

Conclusions

We report the prevalence of avoidable and unavoidable admissions following ambulatory surgery. Structurally unavoidable circumstances still account for the majority of hospital admissions following ambulatory surgery and it is unlikely that intensified preoperative screening can significantly reduce this category. As cases of longer duration predict avoidable admissions, efforts must be focused at identifying potentially inappropriate cases. Our data suggests that ASU admissions can be reduced by utilizing <24-h observation areas, by prioritizing ambulatory surgery cases within the integrated operating room, and by preoperatively identifying social issues that may interfere with discharge. As close to 40% of admissions may be avoidable, prospective studies which evaluate the effect of anaesthetic and surgical innovations, as well as risks inherent to specific procedures, could facilitate a substantial reduction in avoidable admissions. Because these reductions may be reflected as an increase in scheduled inpatient admissions, administrative organization, continuous quality improvement and broad-based studies are required to analyse these trends and develop appropriate corrective measures which will enable more efficient utilization of both the ASU and hospital resources. These findings must be shared with reimbursement parties so that selection of procedures and patients accurately reflect safe clinical practice. With the expectation that in the foreseeable future ambulatory procedures will only increase and available healthcare dollars will only decrease, providers must be proactive and foresighted in their resource allocation decisions.

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Promoting ambulatory surgery – grounds for contention?

(Doubts and questions)

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3rd European Congress on Ambulatory Surgery
1st International Congress on Ambulatory Surgery**

Brussels, 16–17 March 1995

A. The patient asks for ambulatory surgery

The argument that the patients ask for ambulatory surgery can be questioned on grounds of different observations:

1. It is a common experience in the daily practice of most of us that patients rarely ask spontaneously for ambulatory surgery.

Morgan M and Beech R

Variations in lengths of stay and rates of day case surgery: implications for the efficiency of surgical management

'Given the choice, many patients in Britain would probably currently prefer inpatient admission for intermediate surgical procedures, although choosing day case treatment for minor excisions.'

J Epidemiol Commun Health 1990; **44**: 90–105

Kirby RM

Day case surgery

'We have undertaken a survey of 101 patients undergoing either inguinal hernia repair or surgery to varicose veins. Each patient was given a questionnaire on the evening after operation containing a simple question: "Would you like to be going home on the evening of surgery?" Of 44 patients having varicose vein surgery, 25 replied "no" and 19 replied "yes". More importantly, however, of 57 patients who had an inguinal hernia repair 52 replied "no" and five replied "yes", a ratio of

10 to 1 against the idea of discharge on the same evening.'

Lancet 1991; **338**: 1529

Johnson I

Day case tonsillectomy – a public demand?

'This study not only raises the question regarding the public's knowledge of complications, but in the time of the Patient's Charter asks if the public actually wants day-case tonsillectomy.'

J Laryngol Otol 1993; **107**: 765

2. If the doctor proposes ambulatory treatment, a not negligible number of patients refuse.

Davies B and Tyers A

Do patients like day case cataract surgery?

'This is a selected group of patients in that some patients are not offered day surgery because of medical or other reasons and of those who are offered day surgery 30% declined.'

Br J Ophthalmol 1992; **76**: 262–3

3. In choosing ambulatory surgery it is most of the time the doctors' opinion, and not the patients' opinion about ambulatory surgery, that is decisive.

Lowe K, Gregory D et al.

Suitability for day case cataract surgery

'It is the authors' experience that patients who are offered a choice of day case or inpatient management often ask which their doctor would recommend.'

Eye 1992; **6**: 506–9

Morgan M and Beech R

Variations in lengths of stay and rates of day case

surgery: implications for the efficiency of surgical management

'Clinical barriers limiting the adoption of day case surgery or short stay policies may also arise if surgeons do not regard such forms of management as having any clinical advantages.'

J Epidemiol Commun Health 1990; 44: 90-105

4. The results of patient satisfaction measurements are highly variable.

Pica-Surey W

Ambulatory surgery – hospital based vs freestanding

'Few researchers, however, have studied patient satisfaction with ambulatory surgery and the findings of the studies reported are inconsistent.'

AORN J 1993; 57: 1119-27

Duncan P, Cohen M et al.

The Canadian four-centre study of anaesthetic outcomes: III. Are anaesthetic complications predictable in day surgical practice?

'In spite of the widespread development of ambulatory surgery, there has been relatively little critical evaluation of the outcome of this service. Randomization of subjects between inpatient and outpatient facilities has essentially not occurred.'

Can J Anaesthesia 1992; 39: 440-8

Morgan M and Beech R

Variations in lengths of stay and rates of day case surgery: implications for the efficiency of surgical management.

'The majority of patients express a high level of satisfaction, although several studies showed that a significant proportion of patients undergoing day case surgery for inguinal hernia repair and varicose veins would have preferred inpatient care.'

'Similarly, a significant proportion of the cholecystectomy patients (reviewed by Reder et al.) would have preferred a longer period of hospital care. However, the reasons for this preference and the strength of the preference are rarely described.'

'There is also the question of the trade offs that patients are willing to make where there are waiting lists for surgery. For example, the choice between a shorter length of stay and an early operation, or a longer length of stay and a greater waiting time (or between immediate day case surgery and waiting for inpatient care), may result in a preference for the more immediate care option.'

J Epidemiol Commun Health 1990; 44: 90-105

5. It can be observed that patients prefer inpatient surgery without co-payment to one day surgery with (even minor) co-payment. Along similar lines of thinking it has been published that even insurance policies that offer relatively lower out-of-pocket payments for ambulatory surgery do not increase the probability that surgery will be done in the ambulatory setting.

Pauly M and Erder M

Insurance incentives for ambulatory surgery

'The results indicate that insurance policies that offer relatively lower out-of-pocket payments for ambulatory surgery do not increase the probability that surgery will be done in the ambulatory setting.'

Health Services Research 1993, 27: 813-39

Many reasons can be enumerated to explain why a substantial number of patients do not prefer surgery in the ambulatory setting:

- additional discomfort in the ambulatory organization of preoperative assessment
- additional patient load in the organization of his own postoperative care (GP, home nurses, pharmacist...)
- traffic jams at the critical hours of the day
- patient reserves in taking responsibility for the supervision of their own postoperative care or that of their children.

Voepel-Lewis T, Andrea C et al.

Parent perceptions of paediatric ambulatory surgery: using family feedback for programme evaluation

'Eighty-two families (25%) in the sample perceived the outpatient experience as being very stressful.'

J Post Anesthesia Nursing 1992; 7: 106-14

Callanan V, Capper R et al.

Daycase adenoidectomy, parental opinions and concerns

'Parents worried about: their child bleeding at home (53%); bleeding on the way (40%); vomiting at home (39%); vomiting on the way home (35%) and not knowing if their child was sick during the night (44%).'

J Laryngol Otol 1994; 108: 470-3

Schloss M, Tan A et al.

Outpatient tonsillectomy and adenoidectomy: complications and recommendations

'Most revealing, however, were the parents' feelings about their child's first postoperative night. While 60% of the parents reported being somewhat worried if their child was hospitalized for the first night following surgery, 25% were relieved, apparently being reassured by the knowledge that inpatient care was being provided for their child. Conversely, 20% reported that having to care for their child at home would "terrify" them, with an additional 58% experiencing some worry over this possibility. Only 4% of parents felt significant relief due to being able to care for the child in the home environment.'

Int J Ped Otorhinolaryngol 1994; 30: 115-22

While A and Wilcox V

Paediatric day surgery: day case unit admission compared with general paediatric ward admission

'The findings of this small exploratory study concur with those of Caring for Children in the Health Services Organization (CCHS) (1991) that day case admissions must be carefully planned if they are not to cause unnecessary stress for children and their families.'

J Advanced Nursing 1994; 19: 52-7

B. Ambulatory surgery results in a better quality of care

The quality of ambulatory surgery is documented to be good and not to be worse than the quality of the same type of surgery in the inpatient setting. This is, however, not the same as saying that ambulatory surgery leads to a better quality of care. Several comments can be made on this point:

1. In many countries comprehensive, reliable and accessible measured data on the quality of inpatient care do not exist. However, the situation is even worse in the ambulatory setting. Statements about quality are often based on impressions and/or opinions, not on facts or measurements.

Osborne G and Rudkin G

Outcome after day care surgery in a major teaching hospital

'There have been few comprehensive published studies of outcome after day care surgery. More comprehensive outcome studies are required to confirm that the potential advantages of day surgery are realized in practice.' *Anaesth Intens Care* 1993; **21**: 822–7

Warner M, Shields S, et al.

Major morbidity and mortality within 1 month of ambulatory surgery and anaesthesia

'The determination of appropriate candidate selection criteria for ambulatory anaesthesia and surgery in older or less healthy patients is difficult because of a lack of ambulatory outcome data extending beyond the first 24–48 postoperative hours.'

'Reports of ambulatory surgical outcomes that include only the initial postoperative period may underestimate the actual incidence of surgical and anaesthetic-related complications.'

JAMA 1993; **270**: 1437–41

Yozzo J

Is it feasible to track infections in an ambulatory surgery centre?

'The ambulatory surgery centre (ASC) at Northern Westchester Hospital has approximately 55 surgeons performing an average total of 300 surgical procedures every month. After many months of identifying and evaluating infection tracking methods, we were unable to ascertain an infection rate for all patients who visited our ASC. Obtaining a statistically significant response was difficult, leading to questions about each method's validity.'

J Post Anesth Nursing 1989; **4**: 255–8

Michaels J, Reece-Smith H et al.

Case-control study of patient satisfaction with day case and inpatient inguinal hernia repair

'Lack of information about outcome, including less easily measured results such as patient satisfaction, may give a misleading impression and some form of audit of outcome should be carried out.'

'Six patients reported wound problems, five of which were unknown to the hospital.'

J Roy Coll Surg Edin 1992; **37**: 99–100

2. The argument of the reduction of the risk for hospital acquired infection is of minor relevance in the debate since ambulatory surgery patients in general do not belong to any of the risk groups for hospital infections (indwelling catheters, mechanical ventilation, immunosuppression).
3. Many patients mention more postoperative discomfort than they expected.

Oberle K, Allen M et al.

Follow-up of same day surgery patients

Percentage of patients with severe postoperative pain:

Procedure	Postoperative day			
	0	1	2	3
Arthroscopy	29.4	27.6	11.8	5.9
Bunionectomy	53.3	46.7	16.7	6.7
Cataract extraction	15.2	3.0	3.0	NA
Laparoscopy	33.3	29.0	16.1	3.2
Mammoplasty	54.3	31.4	14.3	8.6
Submucosal resection	24.2	39.4	24.2	9.1
Tubal ligation	62.5	15.6	8.4	9.4
Other major procedures	40.6	43.7	18.7	6.2
Other minor procedures	20.6	14.7	11.8	14.7

NA, not applicable.

AORN J 1994; **59**: 1016–25

Astfalk W, Warth H et al.

Day case surgery in childhood from the parents' point of view

'Nevertheless, a total of 40 children (16.8%) have unpleasant or strong memories of the pain they experienced.'

Eur J Pediatr Surg 1991; **1**: 323–7

Duncan P, Cohen M et al.

The Canadian four-centre study of anaesthetic outcomes: III. Are anaesthetic complications predictable in day surgical practice?

'Even with the limitations of the telephone survey, it is disturbing that so many patients reported sore throat, nausea, headache and backache.'

Can J Anaesth 1992; **39**: 440–8

Voepel-Lewis T, Andrea C et al.

Parent perceptions of paediatric ambulatory surgery: using family feedback for programme evaluation

'Thirty-seven of the respondents (12%) felt that their children experienced more postoperative pain than expected. Families of children in the otorhinolaryngology sample perceived significantly more pain than expected than did other families. More postoperative nausea and vomiting than expected was perceived by 33 families (10.4%). The orthopaedic sample perceived significantly more nausea and vomiting than the overall sample.'

J Post Anesth Nursing 1992; **7**: 106–14

Levin P, Stanziola A et al.

Postoperative hospital retention following ambulatory surgery in a hospital-based programme

'The main finding of the present study is that 9.5% of patients undergoing surgery at a hospital-based ambulatory surgery centre were retained in hospital post-operatively for observation or complications. This is much higher than reported in earlier studies.'

Qual Assur Utiliz Rev 1990; 5: 90-4

Philip B

Patients' assessment of ambulatory anaesthesia and surgery

'Although our respondents were discharged on the day of surgery, full recovery required additional days at home. This finding, while not new, is contrary to the popular expectation by patients and surgeons of "street fitness" after "in-and-out surgery". Sixty-two per cent of our patients did not resume normal activities the next day, but instead required an average of 3 additional days.'

J Clin Anesth 1992; 4: 355-8

4. Taking patient satisfaction as an outcome measure, the quality of ambulatory surgery is of varying levels.

Duncan P, Cohen M et al.

The Canadian four-centre study of anaesthetic outcomes: III. Are anaesthetic complications predictable in day surgical practice?

'While the low response rate (36%) to the telephone interviews created a sampling bias, the high rate of patient dissatisfaction among those reached is disconcerting.'

Can J Anaesth 1992; 39: 440-8

Michaels J, Reece-Smith H et al.

Case-control study of patient satisfaction with day case and inpatient inguinal hernia repair

'Nearly half of the patients felt that they were discharged too early and the majority would prefer inpatient treatment.'

J Roy Coll Surg Edin 1992; 37: 99-100

Pineault R, Contandriopoulos A-P et al.

Randomized clinical trial of one-day surgery. Patient satisfaction, clinical outcomes and costs

Patient perception of the appropriateness of length of stay by surgical procedure and mode of care (n = 182):

Surgical Procedure	Mode of care		χ^2
	One-day (%)	Inpatient (%)	
Total for all procedures	100.0	100.0	
Too short	55.9	21.3	22.8*
Appropriate	44.1	78.7	
Tubal ligation	100.0	100.0	
Too short	51.6	20.0	6.6*
Appropriate	48.4	80.0	
Hernia repair	100.0	100.0	
Too short	59.4	25.8	7.3*

Appropriate	40.6	74.2	
Meniscectomy	100.0	100.0	
Too short	56.7	17.9	9.3*
Appropriate	43.3	82.1	

* = P ≤ 0.01.

Patient preference for alternative mode of care by surgical procedure and mode of care (n = 182):

Surgical Procedure	Mode of care		χ^2
	One-day (%)	Inpatient (%)	
Total for all procedures	100.0	100.0	
Same mode	50.5	86.5	26.3*
Alternative mode	48.4	13.5	
Undecided†	1.1	-	
Tubal ligation	100.0	100.0	
Same mode	56.7	93.8	10.8*
Alternative mode	46.3	6.7	
Undecided†	1.0	-	
Hernia repair	100.0	100.0	
Same mode	53.1	77.5	4.09‡
Alternative mode	46.9	22.5	
Meniscectomy	100.0	100.0	
Same mode	43.3	89.3	23.54*
Alternative mode	56.7	10.7	

*P ≤ 0.01. †not included in analysis; ‡P ≤ 0.05.

Med Care 1985; 23: 171-82

While A and Wilcox V

Paediatric day surgery: day case unit admission compared with general paediatric ward admission

'The care offered in the day case unit was found to be woefully deficient in many areas.'

J Adv Nursing 1994; 19: 52-7

C. Ambulatory surgery saves money

In spite of all arguing on patient preferences and quality improvement the real argument for the development and promotion of ambulatory surgery is the claim that it saves money. This claim has not been proved. Observations can even be made that suggest an opposite effect:

1. In the USA, where ambulatory surgery is promoted more than in any other country, healthcare expenditures are growing at a faster pace than in any other country (see Figure 1).
2. No comprehensive study on the macro-economical effects of the introduction of ambulatory surgery exists. Most studies are fragmentary and do not measure all cost elements.

Kitz D, Slusarz-Ladden C et al.

Hospital resources used for inpatient and ambulatory surgery

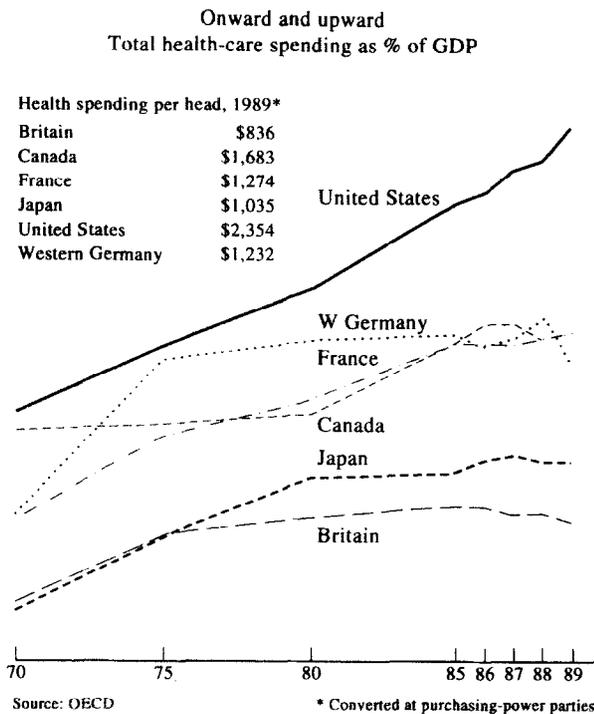


Figure 1. Onward and upward. Total health-care spending as % of GDP

'Costs for other components of care, such as pharmaceuticals and overnight hospital stay, were not available for the period included in this study.'

Anesthesiol 1988; **69**: 383–6

Almost all studies neglect transferred costs.

Detmer D

Ambulatory surgery. A more cost-effective treatment strategy?

'Of course, some of these cost reductions resulted from the transfer of expenditures from the healthcare system to other caregivers, such as the patient's family.'

Arch Surg 1994; **129**: 123–7

Schwartz W and Mendelson D

Hospital cost containment in the 1980s. Hard lessons learned and prospects for the 1990s

'Our calculations include only changes in expenditures for acute care in hospitals and do not indicate the overall effect of these changes on system-wide expenditures for healthcare. When care is transferred to free-standing ambulatory care facilities and physicians' offices, the resulting costs partially offset the savings accomplished in hospital-based care. Because there are not readily available measures of care shifted to settings outside the hospital, we have been unable to calculate the net savings to society.'

New Engl J Med 1991; **324**: 1037–42

Morgan M and Beech R

Variations in lengths of stay and rates of day case surgery: implications for the efficiency of surgical management

'Reductions in lengths of stay and the substitution of day case surgery for inpatient admission reduces hospi-

tal costs per case. However, there are questions of the precise cost savings achieved and the existence of any "knock on" effects, or costs transferred to other caring bodies, such as district nurses, general practitioners and home helps. Finally, there may be social costs (or savings) linked to the time patients and their families are absent from work.'

J Epidemiol Commun Health 1990; **44**: 90–105

These transferred costs can, however, be substantial.

Stott N

Day case surgery generates no increased workload for community based staff. True or false?

'Garraway et al. reported a study in Edinburgh, involving 163 practitioners and 498 patients, in which they investigated the impact of day surgery on general practitioners' workload: one in four practitioners mentioned increased workload and the possibility of additional late house calls as disadvantages of the scheme.'

Ruckley et al. studied 117 Edinburgh patients discharged home the same day after surgery for varicose veins or hernia: a quarter of the nurses said that day surgery had increased their workload significantly. Average levels of contact time (including travelling) in the 3 week follow-up period were 186 min (ward patients), 204 min (convalescent patients) and 325 min (day care patients). This is a clear indication of the greater demands on district nurses when day surgery is involved.'

'Nothing is more erosive to morale than assumptions that transferred costs are trivial when doctors and community nurses know they are being called for postoperative complications or concerns. Patients should expect an excellent proactive postoperative service at home.'

BMJ 1992; **304**: 825–6

Schloss M, Tan A et al.

Outpatient tonsillectomy and adenoidectomy: complications and recommendations

'The effect on family life-style as the result of a surgical procedure and postoperative care of the child can be seen and hypothesized from the data presented. The indirect cost of providing primary postoperative care at home, including parental loss of time from work, the anxiety resulting from the operation and concern over providing in-home post-surgical attention are revealed in the study findings.'

Int J Ped Otorhinolaryngol 1994; **30**: 115–22

Michaels J, Reece-Smith H et al.

Case-control study of patient satisfaction with day case and inpatient inguinal hernia repair

'Although there was no objective difference in recovery, nearly half of the patients felt that they were discharged too early and the majority would prefer inpatient treatment. Day case patients required significantly more medical attention after discharge.'

J Roy Coll Surg Edin 1992; **37**: 99–100

3. Apart from their fragmentary nature most published reports show two fundamental methodological flaws. They use charges as a measure for cost and/or they use average inpatient cost as a measure for the cost of selected patient groups.

Evans R and Robinson G

Surgical day care: measurements of the economic payoff
 'Previous research on this question had not adequately-addressed the issue of cost savings because it tended to rely either on hospital per diem comparisons or on comparison of charges.'

CMA J 1980; **123**: 873-80

Pauly M and Erder M

Insurance incentives for ambulatory surgery

'In 1987, short-term, general community hospitals in the US performed 2 041 455 surgical operations(...). It has been estimated that one-third of hospital costs are related to surgery(...). Since the average charge for each inpatient day was \$530 in 1987 (AHA, 1988), a shift of one inpatient surgery to outpatient in 1987 would have yielded for each inpatient day a saving of \$530 in hospital charges. Assuming that each shift of surgery to outpatient surgery saves at least one inpatient day, the annual savings from a 20% shift to outpatient surgery would have resulted in savings of at least \$21 million in hospital charges alone.'

Health Serv Res 1993; **27**: 813-39

Van den Oever R et al.

Comparison of the average hospital bill for inguinal hernia repair - inpatient vs outpatient (amounts in Belgian francs)

	Inpatient	Outpatient	Difference
Surgery	7111	7115	-4
Anaesthesia	2329	2420	-91
Lab medicine	2775	2550	225
Medical imaging	1119	-	1119
Intensive care	124	-	124
Emergency	129	-	129
Pharmaceuticals	1982	-	1982
Medical surveillance	2517	1200	1317
Stay	20 169	2572	17 597
Total	38 255	15 857	22 398

Adjusted comparison of the average hospital bill for inguinal hernia repair - inpatient vs outpatient (amounts in Belgian francs)

	Inpatient	Outpatient	Difference
Surgery	7111	7115	-4
Anaesthesia	2329	2420	-91
Lab medicine	2775	2550	225
Medical imaging	1119	-	1119
Intensive care	124	-	124
Emergency	129	-	129
Medical surveillance	2517	1200	1317
Total	16 104	13 285	2819

Het Belgisch Ziekenhuis 1992; **211**: 28-31

4. Data have been published in which increases in outpatient expenditures tend to offset the savings in inpatient care.

Schwartz W and Mendelson D

Hospital cost containment in the 1980s. Hard lessons learned and prospects for the 1990s

'If the increase in the number of visits for ambulatory care were equal (in the period 1990-1995) to that in 1987 and 1988, much or all of the savings from cut-backs in inpatient care would be offset.'

'Our findings suggest that the era of easy reductions in the number of inpatient days, with the associated attenuation of rising costs, is largely over. If further reductions in inpatient days are accompanied by an increase in the amount of ambulatory care similar to that during the past few years, the net savings will probably be negligible.'

New Engl J Med 1991; **324**: 1037-42

5. Factors exist which may lead to an increase in healthcare expenditures upon a large-scale development of ambulatory surgery facilities.

(a) For hospitals a large part of the fixed and overhead costs remain when beds are closed but services are maintained.

Morgan M and Beech R

Variations in lengths of stay and rates of day case surgery: implications for the efficiency of surgical management

'These small savings stem from the assumption that hospital overhead costs will remain fixed, and with the exception of nursing costs, the costs associated with the treatment of patients will be unchanged.'

J Epidemiol Commun Health 1990; **44**: 90-105

Detmer D

Ambulatory surgery. A more cost-effective treatment strategy?

'An old but unsubstantiated hospital rule of thumb says that an empty bed costs 80% as much as a full bed.'

Arch Surg 1994; **129**: 123-7

(b) Another factor: the hospital outpatient setting has a much more limited history of cost-containment efforts.

Sulvetta M

Achieving cost control in the hospital outpatient department (OPD)

'The hospital outpatient setting has a much more limited history of cost-containment efforts. Given the relatively short history of attempts to control OPD costs, there has been minimal incentive for providers to control outpatient costs. As a result, Medicare sometimes pays more for an OPD procedure than it does for the same procedure performed on an inpatient basis.'

Health Care Fin Rev 1991; Ann Suppl: 95-107

- (c) The risk for doubling and relative under-use utilization of capital investment.

Detmer D

Ambulatory surgery. A more cost-effective treatment strategy?

'The newly built free-standing ambulatory surgery centres (FASCs) are also changing in terms of appearance and function. In addition to surgical facilities, these centres may incorporate imaging services, laboratories, electrocardiography services and radiation therapy; they often offer some type of hotel accommodation to provide for the short-term stay of patients and families. As such, these facilities have begun to resemble "mini-hospitals" and are moving away from their identity as simply FASCs. In light of an excess of hospital beds in the US, development of these more complex FASCs could further boost the aggregate costs of the American healthcare system.'

Arch Surg 1994; **129**: 123–7

- (d) A factor that may increase expenditure is an increase in the intensity – and consequently also the cost – of inpatient care, of patient throughput and of the number of services delivered.

Haworth E and Balarajan R

Day surgery: does it add to or replace inpatient surgery?

'This study has shown that for all the operative procedures investigated (mastectomy, cystoscopy and inguinal hernia repair in patients aged 15–44) increasing day surgery rates have been superimposed on a steady or increasing inpatient rate.'

'Additional day surgery per se or that which represents a shift from outpatient rather than inpatient care would, instead of saving funds, be more costly.'

BMJ 1987; **294**: 133–5

Detmer D

Ambulatory surgery. A more cost-effective treatment strategy?

'Although the adoption of ambulatory surgery will decrease the costs per case, it will also lead to greater throughput of patients and thus to greater total costs and possible budget overspending. This so-called efficiency trap is one of the reasons hospital administrators and physicians in European countries have been reluctant to adopt ambulatory surgery.'

Arch Surg 1994; **129**: 123–7

- (e) Supply creates demand. The development of minimally invasive diagnostic and surgical techniques confirms the truth of this observation. *

Pauly M and Erder M

Insurance incentives for ambulatory surgery

'The lower user price of outpatient surgery might also, however, create an incentive to increase the use of outpatient surgeries. If the rate of substitution from inpatient surgeries is low relative to the rate of increase in utilization of outpatient surgeries, total utilization of surgeries may increase and charges for surgery may rise.'

Health Serv Res 1993; **27**: 813–39

- 6. The number of warnings against blind and unconditional belief in the cost savings capacity of ambulatory surgery is growing. Ever more, conscientious authors, although defending ambulatory surgery with enthusiasm, ask for rigorous cost-efficiency evaluations.

White P and Smith I

Impact of newer drugs and techniques on the quality of ambulatory anaesthesia

'As new biomedical technology is introduced to facilitate the perioperative management of patients(...), evidence that these systems enhance our ability to continue to provide high-quality, cost-effective healthcare will assume increasing importance. Limitations in healthcare resources necessitate a careful re-evaluation of our clinical practices with respect to choice of drugs, supplies, equipment and even discharge criteria.'

'Ambulatory anaesthesia and surgery will continue to increase because of the potential cost savings for patients undergoing elective operations on an outpatient basis. However, the challenge we face will be to continue to provide high-quality anaesthesia care at a reduced cost. A careful examination of commonly accepted (but unproven) clinical practice patterns will be necessary to meet this challenge.'

J Clin Anesth 1993; **5** (Suppl 1): 3S–13S

These are some comments and some observations which aim to inspire a more critical attitude towards the common statements that patients ask for ambu-

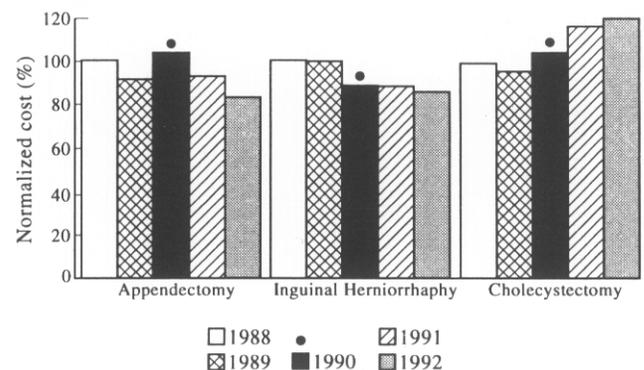


Figure 2. Inpatient expenditures per 1000 enrollees for selected procedures: appendectomy, inguinal herniorrhaphy and cholecystectomy (1988 = 100):

*Examples in Figures 2 and 3 adapted from Legoretta et al., *JAMA* 1993; **270**: 1429–32.

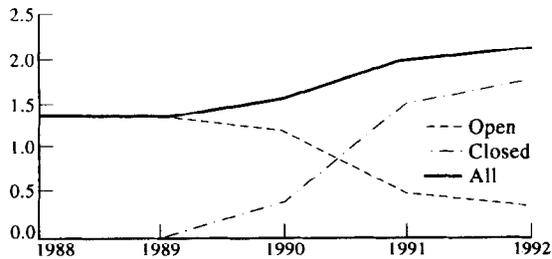


Figure 3. Evolution in the number of cholecystectomies in a south-eastern Pennsylvania HMO (per 1000 enrollees).

latory surgery, that ambulatory surgery is better and that it is cheaper. Space does not allow detailed discussion about:

The nurse, who is lacking the more satisfying relationship that can be built up with the patient in the inpatient setting.

Astfalk W, Warth H et al.

Day case surgery in childhood from the parents' point of view

'In our times, since today fateful occurrences have lost their natural significance, most persons have lost the ideological motivation to assimilate such situations and even the motivation to assimilate is systematically destroyed by our mass media. In the past, this task was assumed by nurses who had preserved a natural empathy for the psyche of fearful parents without necessarily needing to learn each act of comfort. Today, new directions must be sought. Undoubtedly, supportive accompaniment is necessary, a responsibility also for medical insurance and social institutions.'

Eur J Pediatr Surg 1991, 1: 323-7

The surgeon, who worries about the increasing workload.

Morgan M, Beech R et al.

Surgeons' views of day surgery: is there a consensus among providers?

'Problems of workload or case mix were identified as "very important" constraints by 22% of consultants with positive attitudes. This involved a concern with the increased workload if day surgery formed an addition to inpatient care, or a concern about the

balance of their workload if day surgery formed a substitute for inpatient care, as this would increase the proportion of routine procedures undertaken and result in a loss of inpatient beds.'

J Publ Health Med 1992; 14: 192-8

and about the vagueness of his juridical statute in the outpatient setting.

Forceville X, Oxeda C et al.

Peut-on éviter la faute pénale en réalisant une anesthésie ambulatoire?

'Beaucoup d'anesthésistes ignorent qu'en pratiquant une anesthésie en ambulatoire, ils commettent souvent une faute pénale.'

Cahiers d'Anesthésiol 1991; 39: 427-33

Fritz K

Ambulantes operieren. Einführung: wirtschaftliche und rechtliche Aspekte, Möglichkeiten und Grenzen

'Bei den rechtlichen Aspekten steht das Spannungsverhältnis zwischen der Wirtschaftlichkeit ärztlicher Leistungen und den Anforderungen des Haftungsrechtes an die Sorgfaltspflicht im Vordergrund. Dabei gilt in der Rechtsprechung der Grundsatz, dass der Arzt immer dann, wenn zwei gleich wirksame Behandlungsmöglichkeiten zur Verfügung stehen, diejenige wählen muss, die mit den geringeren Risiken belastet ist. Dies bedeutet, dass die ambulante Durchführung eines Eingriffes kein grösseres Risiko haben darf als die stationäre.'

Chirurg BDC 1993; 32: 77-80

The health policymaker who worries about quality, accessibility and equity when he reads:

Schwartz W and Mendelson D

Hospital cost containment in the 1980s. Hard lessons learned and prospects for the 1990s

'Most notably, between 1982 and 1988 the number of inpatient days used by Medicare patients fell by 41%, whereas the number of days used by non-Medicare patients fell by only 15%.'

New Engl J Med 1991; 324: 1037-42

Note

The editors would welcome any referenced responses to the questions raised in this article.

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International Association for Ambulatory Surgery

Ambulatory surgery: a worldwide concern

Hundreds of participants from more than 40 countries took part in the First (1991) and the Second (1993) European Congresses on Ambulatory Surgery.

This success bears witness to growing world-wide interest in the concept of ambulatory surgery. These congresses demonstrated, at an international level, common problems related to healthcare costs and a common interest in developing ambulatory surgery; they brought to light a great many specializations and skills; they revealed the eagerness of participants to initiate and develop international contacts (which were almost non-existent up to that time) and they were a driving force in raising the level of awareness, resulting, in particular, in the proliferation of national and international initiatives. We have thus seen the formation of more and more national ambulatory surgery associations, a growing number of congresses, and legislative action by an increasing number of governments.

The contacts formed at the first two congresses were followed by meetings of delegates from national associations, in London in 1993 and Orlando in 1994. These led to the establishment of the International Association for Ambulatory Surgery (IAAS) by the national associations of 13 countries.

The official founding of the International Association for Ambulatory Surgery took place at the Third European Congress on Ambulatory Surgery (Brussels, March 16 and 17, 1995) which, for this occasion, was held jointly with the First International Congress on Ambulatory Surgery.

The creation of IAAS will be a significant mobilizing force from now on. The wish of the founders of IAAS is to organize at both the national and international levels, encouraging formation of national societies of ambulatory surgery and developing contacts between them. A number of associations have recently been set up in this way, with the intention of joining the international movement.

IAAS is also in close contact with several key persons in different countries in order to structure the national movement and the expansion of the international network. This approach will support one of the main objectives of IAAS, which is to collect, exchange and disseminate information on the concept, on experiences developed throughout the world and on the effectiveness or ineffectiveness of policies implemented in different countries.

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International Association for Ambulatory Surgery

– EXECUTIVE COMMITTEE –

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Opening statement of the founding members

Cost effective, quality care

Providing affordable, accessible, and quality healthcare is one of the greatest challenges to society.

Successful day surgery is superior to inpatient care for many conditions. It is welcomed by patients and is satisfying for surgeons and nursing staff in a well designed and managed day unit. Day surgery is now considered the best option for 50% of all patients undergoing elective surgical procedures (Royal College of Surgeons, London, 1992).

The uninterrupted rise of healthcare costs is an increasing burden on public, as well as individual, finances. Now, more than ever, it is essential that available resources be used in the most responsible way possible.

Modern ambulatory surgery is a powerful tool in managing today's limited resources. From management structures and facilities tailored to the special needs of ambulatory surgery, to the development of new techniques and the appearance of new drugs, ambulatory surgery has made significant contributions.

Ambulatory surgery

In the view of the founding members, ambulatory surgery refers to surgical or diagnostic interventions, currently performed with traditional hospitalization, that could, in most cases, be accomplished with complete confidence without a night of hospitalization. Among other things, these procedures require the same technically sophisticated facilities as when done on an inpatient basis, rigorous preoperative selection procedures and postoperative follow-up of several hours.

Ambulatory surgery is equally well suited for interventions which are not suitable for execution in a practitioner's office.

Terms used to express the concept are: ambulatory surgery, major ambulatory surgery, day surgery and ambulatory anaesthesia.

A distinct concept

Modern day surgery is not simply a shortened hospital stay or an architectural model. Rather, it is a complex, multifaceted concept involving institutional, organizational, medical, nursing, economic and qualitative considerations.

Yet, despite considerable interest in day surgery, governments and other concerned bodies often fail to establish incentives for its active development.

Developing and implementing an effective policy on ambulatory surgery requires considerable change and presents a significant challenge for public health authorities, hospitals, specialists, patients and beneficiaries.

General objective of the IAAS

The general objective of the IAAS is to contribute, in the most comprehensive, yet most effective way possible, to creating favourable conditions for the proper understanding of the concept of ambulatory surgery and to put in place cohesive and effective policies for its practice and permanent evaluation.

The founding members of the IAAS are well aware that differing architectural models exist under varied structural and organizational arrangements and that numerous scenarios, though sometimes quite different, can function perfectly well.

Certainly, the concept has its intrinsic demands but it can – and sometimes must – accommodate itself to some local political, structural, financial, organizational, medical and cultural constraints.

The founding members expressly wish that the IAAS – and each of its active members – provide an open and enriching forum for all partners concerned and that they work together in the pursuit of the Association's objectives, free of partisan spirit, polemics and prejudice.

Extracts from the Provisional Charter

Article 3. Objectives

31. The objectives are:

- To provide an international multidisciplinary forum for the interchange of information and advancement of ambulatory surgery.
- To encourage the development and expansion of high quality ambulatory surgery.
- To promote education in ambulatory surgery.
- To promote research into ambulatory surgery and disseminate the results of this research.
- To provide a database of information.
- To establish guidelines.
- To act as an advisory body to interested parties for the development and maintenance of high standards of patient care in ambulatory surgery facilities.
- To organize meetings and seminars.
- To establish close relationships with other societies or bodies concerned with ambulatory surgery.
- To stimulate the development of national societies of ambulatory surgery/ anaesthesia.

Article 4. Membership

42. Full membership

1. Full members of the Association must meet the following criteria:
 - (a) They must be a non-profit independent organization.
 - (b) They must have goals consistent with those of the Association.
 - (c) Their main interest must be in ambulatory surgery.
 - (d) They must demonstrate a significant representation of ambulatory surgery activity in their own country or at the international level.
 - (e) They must have a major interest in promoting education, research, quality and guideline establishment in ambulatory surgery.
2. Full membership may be given to medical, nursing or management organizations.
3. All applications for full membership will be reviewed by the Council of the Association, whose decision will be final.

43. Associate membership

1. Associate members of the Association must meet the following criteria:
 - (a) They must have goals consistent with those of the Association.
 - (b) One of their major interests must be in ambulatory surgery.
2. Associate members of the Association do not need to fulfil the other criteria for full membership.
3. Associate membership may be granted to individuals or organizations representing medicine, nursing or management indicating a determination to develop ambulatory surgery in their country.

Article 5. Government

51. Council

1. Membership
 - (a) Elected members: Any nation with one or more full member organizations may elect two people from this/these organization(s) to sit on the Council.
International full member organizations may elect one–two representative(s) to sit on the Council at the discretion of a majority of appointed Council members.

Article 6. Meetings

61. International Congress

- An international congress will be organized every 2 years. It will be called: the 'International Congress on Ambulatory Surgery'.

Letter to the members and delegates of the associations now assembled to establish the International Association for Ambulatory Surgery

This is indeed a most historic occasion! It is a privilege to be given the opportunity to express my thoughts to you as you gather to found the International Association for Ambulatory Surgery.

As many of you know, Dr John L Ford and I launched the Surgicenter concept of ambulatory surgery in February of 1970 in Phoenix, Arizona, USA. The first five cases were performed on 12 February in a building which had been designed from the ground up to accommodate the unique needs of the ambulatory surgery patient and his/her physician. Procedurally, the concept was designed to be safe, streamlined, and convenient for all parties concerned.

Twenty-five hundred cases were performed during the first year of our existence. By last month, as we celebrated our 25th anniversary, we had performed over 150 000 cases – all without a death on the premises.

It is gratifying to have played a part in establishing the safety of the concept of ambulatory surgery and to have witnessed the phenomenal acceptance of the idea world-wide. It is a rewarding experience to see how readily the concept can adapt to a wide variety of structural, organizational and other constraints, a feature which has been proposed as 'the general objective of the IAAS' and one which I heartily endorse.

One of my fondest hopes as the concept of outpatient surgery continues to evolve is that quality of care will always be given the highest priority. I also hope that an effort will be made to retain the features which have made the concept so attractive: (1) an administration which understands how to balance best the needs of the patient, the attending physicians and the ancillary personnel; (2) a concern for reasonable charges; (3) a

'tailor-made' design for each patient's care; (4) the creation of an environment where surgeons can function optimally, and (5) the development of a team-spirit by recognizing that each person involved is important to the effort.

What I see as the most favourable development of all in the evolution of the ambulatory surgery concept is the more cordial relationship which it has encouraged between administrators, physicians and all ancillary personnel. The smaller scale of the operation has brought people together in a way which has helped them see and understand each other's thoughts and perspectives to a greater degree than ever before. Doctors have needed to develop more administrative awareness and administrators and managers have needed to address the patients' needs from the standpoint of the physicians, who serve as advocates for the patients. It would be wonderful if this encouraging trend could continue, so that 'bottom-line' considerations would always be secondary to compassionate, quality-oriented care of every patient.

These are the thoughts I would have expressed to you if I had been able to address you in person. I appreciate greatly the friendly encouragement I have received from Dr Claude de Lathouwer and his capable assistance in enabling the contents of this letter to be shared with you. I close now by congratulating each of you on your presence here today and by wishing all of you the very best as you implement the lofty objectives pursued by the International Association for Ambulatory Surgery.

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