AMBULATORY SURGERY

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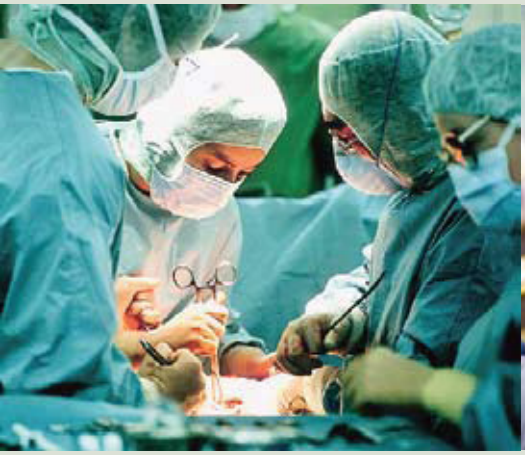


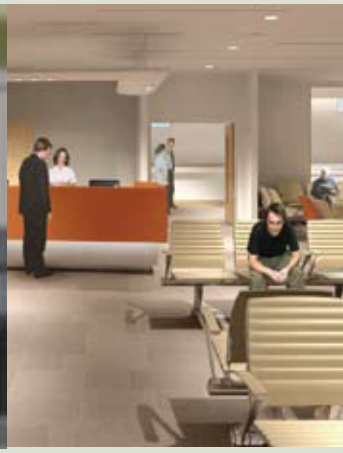

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Editorial

Mark Skues, Editor-in-Chief

This edition of the Journal contains a series of papers reviewing amongst other things, outcomes for ambulatory shoulder surgery for patients with obstructive sleep apnoea, the incidence of postoperative nausea and vomiting with the use of total intravenous anesthesia, a case report of two patients with unexpected monoparesis potentially induced by midazolam, and the first of what hopefully might be many, reviewing the ten year performance of ambulatory surgery in England, using the newly developed criteria for suitable procedures.

Wallisch and co-workers have evaluated the outcomes and respiratory complications of 48 patients with obstructive sleep apnoea (OSA) having shoulder surgery where an interscalene block, together with propofol and ketamine sedation formed the anaesthetic technique. They noted no significant changes in oxygen saturation in the post-operative period, and when phoned on the first post-operative day, only 5 (10%) patients reported mild dyspnoea on return home. Whilst this paper is interesting in describing the peri-operative events potentially associated with OSA, they make no mention of longer term outcomes, where it is known that sleep studies may be exacerbated for three days post-operatively [1].

Bayter et al, in a multi-centre study, report on the incidence of postoperative nausea and vomiting with the use of total intravenous anaesthesia. They report a 10% risk of nausea and 5% risk of vomiting, maximal in the 4 hour period after surgery, and then decreasing 24 hours after discharge. These results seem sensible, given the evanescent effects of the intravenous anaesthetic technique used, and the authors hypothesise that the use of strong opioids for analgesia in the immediate post-operative period may have contributed to the emetic risk.

Shih and colleagues report on two patients undergoing ambulatory surgery who experienced monoparetic symptoms after the administration of 2mg of midazolam. Aware that there is a potential for re-emergence of stroke deficits and transient ischemic effects with midazolam, the authors describe the sudden onset of weakness immediately pre-operatively, and their subsequent management. Thankfully, no adverse outcomes arose from this phenomenon, and the report acts as a potential alert to readers, though the occurrence seems extremely low.

The fourth paper is a contribution describing the 10-year performance of ambulatory surgery in England, from data collected by NHS Digital, the national repository for the National Health Service. The authors have collated information based upon the proposed revisions to the cohort of procedures deemed suitable for Ambulatory Surgery, to establish the current 'state of play' for their country. I am hoping that this paper provides a template for others to report similar national status, though I am aware that preparations on this subject are in progress for presentation at next year's international congress in Porto.

And finally… Arrangements are in place for the IAAS European Congress 2018 that will be taking place in Budapest on 11th-12th May, this year. As noted before, the meeting promises to be a demonstration of the best of ambulatory care with a surfeit of expertise from invited speakers offering their insight into the current status of ambulatory surgery. Details are available at

http://iaaseuropeancongress2018.com

for registration and accommodation, so I hope you will be able to attend. I look forward to seeing you there.

Mark Skues
Editor-in-Chief

Reference

1. Chung F, Liao P, Yegneswaran B et al. Postoperative Changes in Sleep-disordered Breathing and Sleep Architecture in Patients with Obstructive Sleep Apnea. ***Anesthesiology*** 2014;**120**:287–98.

Outcomes for Ambulatory Shoulder Surgery Patients With Sleep Apnoea

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Abstract

Background: Obstructive sleep apnea poses significant risks for patient in the perioperative period. We evaluated respiratory outcomes and complications in a population of ambulatory shoulder surgery patients, during the perioperative period and on the first postoperative day

Methods: After interscalene block with a mixture of mepivacaine and ropivacaine, 50 patients received anesthesia with propofol and ketamine in beach-chair position for arthroscopic shoulder surgery. Respiratory parameters were collected before surgery, in recovery and step-down recovery, and via phone call on the first postoperative day.

Results: Oxygen saturations were lower in the postoperative phase, but not to a degree of clinical significance. There were no episodes of severe hypoxemia or respiratory obstruction. No patient required admission to the hospital. 10.1% of patients noted mild dyspnea at home.

Discussion: Use of regional anesthesia and sedation provided favorable postoperative respiratory effects, for the first 24 hours, substantiating this approach for ambulatory patients

This report was previously presented, in part, at the ASRA 2013 meeting.

Keywords: Interscalene Block, Obstructive Sleep Apnoea, Ambulatory Surgery.

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Introduction

Obstructive sleep apnoea (OSA) is a disease process characterized by disordered breathing during sleep. This disease is under-diagnosed and is estimated to affect 17% of adults ages 30-69 [1]. The degree of effect of this disease can vary from mild to severe, which poses many problems for the anesthesia provider. It is estimated that 24% of patients have undiagnosed OSA [2], so a large portion of the surgical population may come to surgery without ever being tested for OSA. This affects the anesthetic techniques used during surgery.

Shoulder arthroscopy is a common outpatient surgical procedure for which interscalene block (ISB) is commonly utilized to provide perioperative pain control. One disadvantage of ISB is paresis of the ipsilateral hemidiaphragm caused by blockade of the phrenic nerve, which has been shown classically to occur in 100% of patients [5]. Although this is well tolerated by most patients, it may be particularly problematic for patients with preexisting pulmonary disease or a predisposition to hypoxemia, such as those with OSA. OSA patients may have a collapsible upper airway and common co-existence with obesity puts these patients at risk for difficult mask ventilation and tracheal intubation [3]. They are also at increased risk for postoperative airway obstruction, and have a nearly threefold increased risk of postoperative complications compared to non-OSA patients [4].

At our outpatient center, approximately 9% of the shoulder surgery population present with known sleep apnea. In seeking optimal anesthetic management of these patients, we evolved a technique which utilizes an intermediate-duration mixture of local anesthetics for interscalene block, followed by propofol-ketamine sedation with a natural airway in beach-chair position, with an attempt to minimize perioperative opioids. In this prospective, observational investigation, our primary aim was to characterize the respiratory events and self-reported symptoms of ambulatory shoulder surgery patients with OSA utilizing our preferred anesthetic plan, during the immediate recovery period and in the same day surgery unit, as well as at home on the first postoperative day. We also evaluated the duration of effective pain control with the interscalene block, as well as the occurrence of unplanned induction of general anesthesia, or admission to an inpatient unit. In addition, we compared the subset of morbidly obese OSA patients (BMI over 40) to those with lower BMI with regard to respiratory and oxygenation parameters.

Methods

The prospective, observational portion of the study was performed at three ambulatory surgical centers at the University of Pittsburgh Medical Center, a large network of hospitals located in Western Pennsylvania. After obtaining institutional review board approval, patients were enrolled in the study based on a known or suspected history of OSA [6]. Patients were designated as having suspected OSA based on high clinical suspicion as outlined by the ASA Practice Guidelines [7]. Exclusion criteria included age <18, refusal of nerve block, true allergy to amide-type local anesthetic, infection at the desired site of needle insertion, coagulopathy, pregnancy, COPD with hypoxemia, and preexisting neuropathy in the extremity to be blocked. For the patients who met inclusion criteria, written informed consent was obtained after a thorough discussion of the study and its goals.

Baseline demographic characteristics were recorded for each patient, which included age, sex, BMI, home OSA therapy, and smoking status. For the ISB, standard ASA monitors were applied, and supplemental oxygen was supplied via nasal cannulae. Midazolam 1–2 mg and Fentanyl 50–100 mcg were administered, titrated to a level of sedation which permitted verbal interaction during the ISB procedure. Ultrasound-guided ISB was performed with a Sono-Site

S-Nerve unit, utilizing a 6-13 MHz linear array transducer (Sono-Site, Bothell, Washington), in combination with nerve stimulation. When the C-5 and C-6 nerve roots were visualized in vertical alignment between the scalene muscles, 20 ml of a mixture of local anesthetic agents (0.2% ropivacaine + 1.6% mepivacaine) was injected in small aliquots into the interscalene groove, following repeated negative aspirations. Patients then underwent shoulder arthroscopy in beach-chair position with combined propofol and ketamine sedation, including supplemental fentanyl for additional analgesia if necessary.

Respiratory function was assessed for each patient in the different phases of care, including pre-sedation (baseline), post-sedation, post-block, post-operatively in the PACU, and prior to discharge in phase 2 of recovery. Assessments included direct observation for episodes of obstruction, pulse oximetry, respiratory rate, and oxygen requirements at each phase. Any necessity of converting the case to general anesthesia (defined as insertion of an endotracheal tube or laryngeal mask airway in the operating room) was noted.

Upon arrival to the PACU, numeric rating score (NRS) pain scores (0–10) were recorded, as well as the amount of hydromorphone or oral opioids administered. Patients were discharged from the PACU to Phase 2 recovery based on modified WAKE criteria [8]. Total PACU time was noted, as was any occurrence of unexpected admission to an inpatient facility was recorded.

All patients were contacted via phone on the first post-operative day for follow-up. At that time they were asked about the time of first pain experienced, and the time of first opiate use, in order to assess the duration of the block. They were also queried regarding subjective changes in breathing pattern, the ability to cough post-operatively, presence or absence of dyspnea, CPAP usage after discharge, and any persistence of neurological symptoms such as numbness, weakness or tingling.

Data was reported as simple descriptive statistics. We undertook a post-hoc comparison between overweight/obese (BMI < 40) and morbidly obese (BMI > 40) patients for oxygenation parameters, utilizing unpaired t-tests, with statistical significance defined as two-tailed p-value less than or equal to 0.05.

Results

51 patients were enrolled, however three were excluded due to an attending anesthesiologist preference for tracheal intubation from the onset of the case. All of the ISB were successful; there were no unplanned conversions to general anesthesia (three patients were excluded because they received a general anesthetic with endotracheal tube placement that was planned, due to the preferences of the attending anesthesiologist). Demographics are shown in Table 1, along with oxygen saturations throughout the perioperative course for all patients, and other durations of their perioperative course.

Table 1 Patient, Operative and Block Information.

Age, years (mean ± SD)	55.5 ± 9.9
Gender, n (male/female)	27/21
BMI (mean ± SD)	35.6 ±4.8
CPAP usage (yes/no)	25/23
Smoking status (smoker/nonsmoker)	7/41
Pre-block SpO_2 (mean ± SD)	97.1 ± 2.2
Post-block SpO_2 (mean ± SD) *	97.3 ± 2.4
PACU SpO_2 (mean ± SD) *	97.1 ± 2.3
SDS SpO_2 (mean ± SD)	96.3 ± 1.8
Surgery Duration, min (mean ± SD)	50.8 ± 17.7
PACU Stay, min (mean ± SD)	37 ± 27
Block Duration, h (mean ± SD)	10.83 ± 4.57

None of the patients experienced hypoxemia (SpO_2 less than 90%) before or after surgery, and none required supplemental oxygen after discharge from the PACU. There was a small but statistically significant difference between pre-block SpO_2 and SDS SpO_2 (97.1 vs. 96.1, $p < 0.005$). There were no reported episodes of respiratory obstruction in PACU or SDS. 4% of patients (2/48) experienced dyspnea in SDS. All of the patients rated this symptom as mild, and it did not interfere with their activities.

Results of the post-hoc comparison of those who were overweight/obese (BMI 25–40) or those with BMI greater than 40 are noted in Table 2. Oxygen saturations on room air before the block and after return to the same-day-surgery unit, were not different between the two groups. None of the patients had difficulty with effective cough. Mean pain scores were 1.02 in PACU. The mean block duration was 10.8 hours, and was not different in the two groups (Table 2). All of the nerve blocks had resolved by the time of the follow up phone call, and there were no residual neurologic symptoms. Five patients (10.1%) experienced mild dyspnea upon returning home. There were no required admissions to the hospital or emergency department visits for either group.

Discussion

We sought to evaluate the impact of a specific regimen of anesthesia for OSA patients presenting for ambulatory shoulder surgery. Specifically, we provided an intermediate duration ISB, with propofol plus ketamine sedation and mask oxygen/spontaneous ventilation. We found that none of the patients required admission to the hospital or had episodes of observed ventilatory obstruction in either PACU or same-day surgery. In addition, none required conversion to general

Table 2 Overweight/Obese (BMI<40) vs Morbidly Obese (BMI >40) patients.

	Morbidly Obese (n = 8)	**Obese (n = 40)**	**Significance**
Mean BMI (mean ± SD)	41.9 ± 3.39	33.95 ± 3.78	p<0.0005
Pre-block SpO_2, % (mean ± SD)	96.4 ± 2.13	97.3 ± 2.06	P = 0.25
Surgery Duration, min (mean ± SD)	51.4 ± 11.4	51.1 ± 18.8	p = 0.96
Phase 2 SpO_2, % (mean ± SD)	95.3 ± 0.7	96.3 ± 1.8	p = 0.11
Block Duration, hr (mean ± SD)	11.48 ± 6.35	10.5 ± 4.1	p = 0.6

anesthesia (i.e. requirement of laryngeal mask airway or tracheal tube due to inadequate analgesia and requirement of greater depth of anesthesia). Patients were able to wean to room air quickly, and had very few subjective respiratory complaints. Surprisingly, measured room air oxygen saturations after surgery were not meaningfully changed from baseline in these patients, despite the sedation, IV opioids and interscalene brachial plexus block with volumes likely to produce diaphragmatic paralysis.

Obstructive sleep apnea is a sleep disorder characterized by episodes of apnea or hypopnea caused by complete or partial airway obstruction. Apnoea is defined as complete cessation of airflow during sleep, while hypopnea is reduced airflow during sleep. An apnoea-hypopnea index is used to characterize the severity of the disease based on the number of apnoea and/or hypopnea events within an average hour of sleep, as measured by polysomnography. A score of 5-14 is classified as mild OSA, 15-30 is moderate OSA, and > 30 events is considered severe OSA [9].

Obstructive sleep apnea also has a significant impact on perioperative care. Multiple studies have shown that patients with OSA are at increased risk for difficult mask ventilation [10–13] and difficult intubation [13–15]. Intraoperatively, OSA patients may require higher airway pressures to deliver adequate tidal volumes during mechanical ventilation, given the restrictive-type respiratory pathology caused by their obesity. This may prove to be a challenge during laparoscopic procedures, in particular.

It has been well-documented that patients with OSA are at increased risk for hypoxaemia post-operatively [16]. Anesthetics agents are known to adversely affect patients with OSA [17], and opioids in particular may predispose to disruptions of sleep, and increased apnoeic epidoses [18]. This may underlie the increased frequency of adverse postoperative events that occur in this population [19]. Some large-scale, national database studies provide evidence that regional anesthesia reduces postoperative complications and mortality in patients with OSA [20]. In light of these data, many authorities recommend avoiding opiates and emphasize use of alternative multimodal analgesia techniques, including the most recent recommendations by the ASA Task Force for the management of patients with OSA [7].

Given the high potential for perioperative complications stemming from OSA, there has predictably been a large amount of debate as to who should be considered for outpatient ambulatory surgery. Recently, the Society for Ambulatory Anesthesia released guidelines for the preoperative selection of adult patients with OSA for ambulatory anesthesia. These guidelines suggested that patients with known OSA whose comorbid conditions are optimized and are able to use CPAP postoperatively are suitable candidates for ambulatory anesthesia. However, patients with OSA or presumed OSA with non-optimized comorbid conditions are considered not suitable for ambulatory anesthesia [21]. Due to a paucity of data in outpatients, such recommendations are necessarily based primarily on expert opinion, and further evidence is necessary to guide decision-making in this area.

In a recent retrospective review, we assessed outcomes in over 15,000 patients who had undergone shoulder surgery in beach-chair position, with interscalene block and propofol-ketamine sedation [22]. Serious complications were very unusual, and the incidence of adverse occurrences in those with OSA in this population was similar to their proportion of the overall population, suggesting that there has been no predisposition to complications in this sub-group. This is true for the range of adverse outcomes and in particular for respiratory system occurrences. There have been no respiratory arrests or deaths among patients with OSA undergoing this anesthesia technique, in what we estimate is over 1500 patients with diagnosed sleep apnea (and undoubtedly a significantly higher number if one considers those who suffer from this condition but were not diagnosed at the time of surgery). This suggests, but does not guarantee, a reasonable margin of safety for this technique in this vulnerable subset of patients.

Both proven and suspected OSA patients are included in our prospective study, based on known history by the patient, a sleep study report in the chart, or clinical suspicion based on the ASA guidelines [7]. It is acknowledged that patients without formal sleep testing may not actually have the disease. Another limitation of this study is that patients were contacted at 24 hours, not later in their postoperative course. It is possible for patients to have complications related to OSA several days after surgery, though such adverse outcomes would be very unlikely to be related to the anesthetic regimen, and more likely to be related to oral opioid analgesics. In addition, our sports orthopedic service keeps us well-informed of complications that occur with patients we have anesthetized, which may be detected on follow up visits but not initially elicited in phone calls by our service. For SpO_2 levels, we relied on nurses' entry of vital signs in the electronic medical record, as well as our own observations at bedside- we did not have access to records of continuous readout in PACU, though nurses are required to call the attending physician for hypoxemia (SpO_2 at 90% or less) or for any evidence of respiratory obstruction. SpO_2 levels in phase 2 recovery are obtained only on admission from PACU, and later if any clinical respiratory symptoms are reported or adverse event occurs. Reported events that patients experienced after returning home are necessarily subjective. 24-hour inpatient observation would provide a more comprehensive record of symptoms, hypoxia or airway obstruction during this period.[17] Lastly, this is a relatively small, prospective observational study, to establish the practicality of this approach. However, our large retrospective database [22] provides additional substantiation of the safety of this approach.

In conclusion, evidence of airway or oxygenation compromise was unusual in this OSA population undergoing shoulder surgery in beach-chair position, with interscalene block, and propofol-ketamine sedation and natural airway. The described approach has proven effective for management of patients with OSA in the outpatient setting, minimizing postoperative respiratory complications or complaints.

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Incidence of Postoperative Nausea and Vomiting when Total Intravenous Anaesthesia is the Primary Anaesthetic in the Ambulatory Patient Population

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Abstract

Introduction: This observational prospective study was designed to assess the incidence of postoperative nausea and vomiting (PONV) in patients presenting for ambulatory surgery. A total intravenous anesthesia (TIVA) technique and PONV prophylaxis guidelines were used.

Methods: This is an observational study. Patients between 18 and 60 years old, American Society of Anesthesiologists (ASA) I-III with a body mass index (BMI) less than 30, scheduled for ambulatory surgery with TIVA were included.

Results: The highest incidence of PONV occurred 4 hours after leaving PACU, which correlates with the time point with the highest incidence of pain. A history of PONV was the most significant risk factor with a P of 0.002 and a prevalence ratio (PR) of 3.39 for nausea. We also found an association between the incidence of nausea and the need for additional pain management with a p of 0.0095 and PR of 2.22.

Conclusion: A TIVA technique has a significant impact in the incidence of PONV with a protective effect during the first 24 hours post-surgery according to our study. The effect seen is extremely valuable in the ambulatory setting where rapid turnovers are needed and access to hospital beds can be limited.

Keywords: Total Intravenous Anesthesia; Postoperative Nausea and Vomiting; Ambulatory surgery.

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Introduction

Postoperative nausea and vomiting (PONV) are considered two of the most undesired complications related to anesthesia with pain being the third one. Pain has a high association with PONV mainly due to the side effects of the opioids used to treat it. [1–3]. These complications lead to delayed recovery, prolonged hospital stay, unplanned readmissions and increased healthcare costs [4]. As a result, there are guidelines and recommendations regarding the use of PONV prophylaxis. Total intravenous anesthesia (TIVA) has been recommended as one of the main anesthesia techniques to minimize the occurrence of PONV and its side effects [5–10].

The reported incidence of PONV in patients not receiving prophylaxis is about 20 to 30%. In patients with risk factors It can be as high as 80% [2,9,11,12]. PONV risk factors are related to the patient's characteristics, type of surgery, and the anesthesia technique [13]. The Apfel criteria are the best predictors for PONV in the perioperative arena [14,15]. According to the Apfel scoring system and the Society for Ambulatory Anesthesia (SAMBA) PONV guidelines, one can estimate the risk of PONV. The risk can be as high as 80% if a score of 4 is obtained in the Apfel scoring system or as low as 10% if no criteria are met [11,16].

As previously mentioned, anaesthetic technique is a key factor in the occurrence of PONV. Inhaled anesthetics can increase its incidence up to 9 times when compared to regional anesthesia [17]. Inhaled anesthetic use becomes the highest risk factor for the occurrence of PONV within the first two hours after surgery [18,19]. Others studies have shown that when TIVA is used the incidence of PONV decreases between 25 and 50%, mainly due to the use and mechanism of action of propofol. This protective effect of propofol has been well documented in the literature [11,20].

This observational prospective study was designed to assess the incidence of PONV in patients presenting for ambulatory surgery. A TIVA technique and the PONV prophylaxis guidelines from SAMBA were used in our study.

Objectives and Methods

To determine the incidence of PONV in patients receiving TIVA as their primary anaesthetic in an ambulatory center in Santander, Colombia between January and December 2016.

Study design

This is an observational study. The subject population consisted of patients that had ambulatory surgery in the ambulatory program at Clinica El Pinar in Santander, Colombia. Trained personnel at the institution collected the information. The Ethics Committee of

Clinica El Pinar approved the intervention protocol.

Study Population: Patients that presented for scheduled ambulatory surgery at clinica el Pinar.

Inclusion Criteria: Patients between 18 and 60 years old, American society of anesthesiologists (ASA) I-III with a body mass index (BMI) less than 30, scheduled for ambulatory surgery with TIVA. No nitrous oxide was used at any point during any of the anaesthetics.

Exclusion Criteria: Patients of ASA IV or whom required hospitalization after the procedure.

Sample size: We used the Open Epi™ Software. We used a PONV incidence of 50%, incidence that has been reported by the last consensus Guidelines for the Management of PONV published by the Society for Ambulatory Anesthesia (SAMBA) [21]. A significance level of 95% and a potency of 80% were used to calculate our sample. Our calculated sample was 364 patients.

Data Analysis: All obtained information was entered into an Excel database. The data was then exported and a descriptive and bivariate analysis was executed using Stata™ 12.0 software.

The descriptive analysis of the qualitative variables was done by using relative and absolute frequencies. The quantitative variables are presented as median and standard deviation. We performed a bivariate analysis to calculate the prevalence ratio using poisson regression, p values and confidence interval.

Table 1 PONV prophylaxis used.

Prophylaxis	% Patients	Average Dose	Dose Range
Dexamethasone	99%	4 mg	4–16 mg
Ondasetron	92%	7.75 mg	4–8 mg
Haloperidol	14.2%	1 mg	0.5–2 mg
Metoclopramide	4.6%	10 mg	10 mg

Table 2 Pain control medications used.

Prophylaxis	% Patients	Average Dose	Dose Range
Ketoprofen	88.8 %	99,57 mg	50–100 mg
Morphine	61.6 %	3,68 mg	2–8 mg
Tramadol	40.1 %	79,34 mg	50–100 mg
Diclofenac	4.6%	10 mg	10 mg
Ketamine	4.6%	12 mg	10–30 mg
Acetaminophen	0.5%	750 mg	500–1000 mg
N butil bromure of Hioscine	0.3%	20 mg	20 mg

Results

Descriptive Analysis

A total of 367 patients were enrolled in our study. The average age was 34.1 years with a standard deviation of 12.7. Regarding gender, 13.62% of patients were male and 86.38% were female.

The vast majority of our patients were ASA 1, 85.01%. 14.44% of patients were ASA 2 and 0.545% were ASA 3. The average weight was 63.28kg, height was 163 centimeters and BMI was 23.61.

Regarding comorbidities, 8.5% of patients were obese, 4.9% were hypothyroid, 2.2% had a history of hypertension and 0.5% had Type 2 diabetes mellitus.

In our study 12% of patients had a history of PONV, 16.6% of motion sickness and 0.3% of patients had experienced nausea and emesis within the previous 24 hours. None of the patients were taking any kind of medication for PONV prophylaxis.

Regarding a history of substance abuse, 7.9% of patients had a history of tobacco smoking.

5.7% of patients presented comorbidities such as anxiety, depression, gastritis, allergic rhinitis, irritable bowel and carbohydrate intolerance.

All patients included in the study had TIVA as their primary anesthetic. Our TIVA consisted of a targeted control infusion (TCI) of propofol and remifentanil. A bispectral index (BIS) between 40 to 60 was used to assess the depth of anesthesia.

The main surgical intervention in our study population was esthetic surgery accounting for 82.6% of the cases. Out of this percentage, mammoplasty augmentation was the most common procedure with 51% of patients, followed by liposuction with 18.5% of patients.

Other surgical interventions included rhinoplasty, orthopaedic procedures such as arthroscopies, and general surgery procedures such as herniorrhaphies. The average length of the different procedures was 1 hour and 37 minutes. An umbilical herniorrhaphy was the shortest surgical intervention with a duration of 10 minutes. The longest procedure was a liposuction with mammoplasty augmentation lasting 360 minutes.

The incidence of PONV was assessed at 4 time points during the perioperative period. First when leaving the operating room, second when leaving the post anesthesia care unit (PACU), third 4 hours after leaving PACU and finally 24 hours after discharge.

At the end of the procedure 2.0% of patients presented with nausea and 0.3% had emesis. 16.9% of patients experienced pain at this time point. Out of this percent, 30.6% required morphine for pain control.

When leaving PACU, 3.8% of patients experienced nausea and 0.3% emesis. 23.8% of patients had mild to moderate pain, 3.2% of these patients required pharmacologic pain management with less than 3mg of morphine in 90% of cases.

10.1% of patients leaving PACU at 4 hours manifested nausea and 5.3% mild emesis. 38.7% of patients had mild pain that did not require pharmacological intervention. 14.7% of patients had moderate pain with half of this group requiring pharmacological management with NSAIDS and 4.6% with severe pain requiring opioids.

At the 24 hour PACU post-discharge time 10.1% of patients had nausea and 3.9% emesis. 63.5% of patients had pain with 60% of this percentage having mild pain that was managed with oral over the counter analgesics.

86.7% of patients were satisfied with their care given a score of 10 out 10 for Clinical El Pinar and 95.4% of patients gave a score of 10 out of 10 to the anesthesiologists taking care of them.

Bivariate Analysis

The highest incidence of PONV occurred 4 hours after leaving PACU which, interestingly, correlates with the time point with the highest incidence of pain referred by our patients.

A history of PONV was the most significant risk factor with a P of 0.002 and a prevalence ratio (PR) of 3.39 for nausea. For emesis

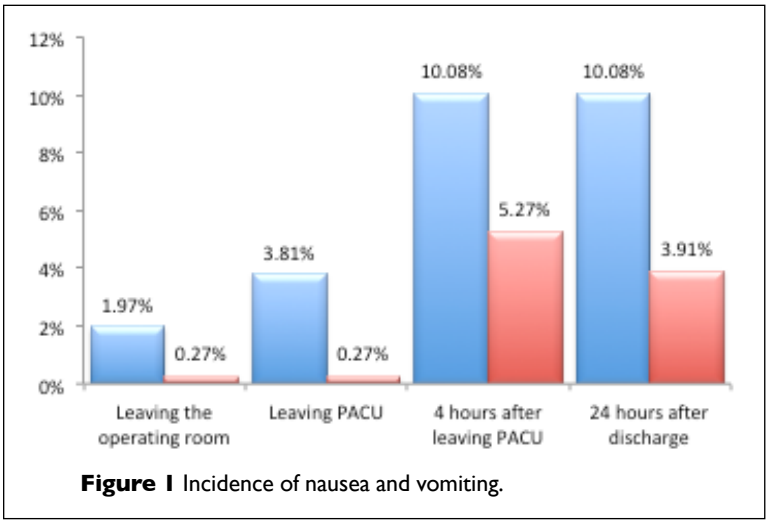

Figure 1 Incidence of nausea and vomiting.

we calculated a P of <0.0001 and a PR of 7.35 A history of motion sickness had a P of 0.0493 and a PR of 2.56.

The incidence of nausea was clearly correlated with the occurrence of pain. Nausea had a strong correlation with moderate pain at PACU arrival (p:0.0473 and PR:4,22) and PACU discharge (p:0.0002 and PR: 9,08) and severe pain at PACU discharge (p: 0.0473 and PR:4,22).

We also found an association between the incidence of nausea and the need for additional pain management with a P of 0.0095 and PR of 2.22.

Discussion

The results of our study show a significant reduction in the incidence of PONV. This effect is pronounced within the first 24 hours after ambulatory surgery when a TIVA technique is used.

It is important to mention that in our study we used a TIVA technique and followed the SAMBA PONV guidelines.

During the first hour 1.97% of patients presented nausea and 3.81% within the second hour in PACU. The incidence of emesis was 1% within the first 2 hours. When looking at pain control after surgery, 24% of patient needed pharmacological management with morphine. We also found an increase of 10% in the incidence of nausea and 5% of emesis 4 hours post PACU discharge. We believe this is most likely related to the use of narcotics for pain control on discharge and the ride home. Finally we found that at 24 hours the incidence of nausea did not increase and that of emesis when down by 40%.

The incidence of PONV found in our study correlates with the one reported in the literature around the globe. It also adds to our knowledge of PONV incidence in Colombia. Based on our findings we believe that a TIVA technique has significant advantages, one of which is the protective effect on PONV. Propofol is the cornerstone in this technique and has a significant effect on the decreased incidence of PONV. The potential mechanisms have been described extensively in the literature. [22–24]

Risk factors for PONV are widely known in the literature [2,9,11,12]. The higher incidence of PONV post hospital discharge is most likely related to the use of opioids for pain control before discharge and the ride home.

Finally a key metric for both surgeons and anesthesiologists is patient satisfaction. We found this to have a significant impact in patients' lives and recovery. We calculated patient satisfaction at 86%.

Conclusion

A TIVA technique has a significant impact in the incidence of PONV. This technique has a protective effect during the first 24 hours post surgery according to our study. The effect seen is extremely valuable in all patients but more so in the ambulatory setting where rapid turnovers are need and access to hospital beds can be limited. Avoiding PONV also adds to patient satisfaction, better pain control, and avoidance of increase healthcare costs by decreasing unnecessary hospitalizations and readmissions. We believe that a TIVA technique and the implementation of the SAMBA PONV prophylaxis guidelines should be considered in all ambulatory surgicenters.

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Midazolam-induced unexpected monoparesis: Not contraindicated for ambulatory general anesthesia

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Abstract

Midazolam has been used widely at premedication to general anesthesia without many complications, but reemergence of the transient ischemic attacks (TIAs) in patients with previous TIA or stroke have been reported. We found similar cases of self-limiting transient hemiplegia with midazolam use in patients without previous history of TIA or stroke, and the self-limiting effects did not recur after proceeding with general anesthesia. We believe that midazolam-induced TIAs is not a contraindication to ambulatory general anesthesia.

Keywords: midazolam, general anesthesia, transient ischemic attack, unilateral events.

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Introduction

Midazolam has been used widely as a premedication to general anesthesia because of its favorable safety profile, and rapid anxiolytic effect [1]. Re-emergence of stroke deficits [2] and transient ischaemic attacks (TIAs) with midazolam challenge has been reported [3]; however, midazolam induced unexpected (without previous history) monoparesis has not. We report two patients who demonstrated unexpected and transient unilateral events after intravenous (IV) midazolam injection not contraindicated for ambulatory general anesthesia. We review the literature and discuss the rationale behind these findings. Informed consents were obtained from these patients.

Patient 1

A 45-year-old female, 84 kg, and 167 cm was scheduled for an ambulatory hysteroscopy and endometrial ablation. She smoked 2 packs per day for 20 years and received a coronary bypass surgery 4 years ago; however, she denied any history of neurological diseases. Physical examination, laboratory tests, and ECG results were unremarkable. She was cleared for surgery by an internist. After 2 mg IV midazolam injection was given as a premedication to ease her anxiety, she described: "only the left side of her body was relaxed" and requested some more for the right side. An immediate neurological consultation was arranged which revealed a normal neurological examination and a normal computed tomography (CT) image. The operation continued with endotracheal general anesthesia uneventfully, induced by 150 mg IV propofol and maintained with sevoflurane/nitrous oxide/oxygen mixture and 100 mcg fentanyl throughout the 40-minute procedure. Forty-five minutes later when the patient had been fully awake and alert in the post-anesthesia care unit, repeated neurological examination revealed no detectable abnormality. She was discharged home. A phone follow-up 24 hours later revealed no neurological sequelae.

Patient 2

A 72-year-old female, 100 kg, and 163 cm underwent wide excisions of lesions and skin grafts on her right arm. She had a history of diabetes, heavy smoking, and coronary artery bypass surgery 1 year ago but denied any previous neurologic disorder. Her daily activities and walking were well tolerated. She too was medically cleared for surgery. After 2mg IV midazolam injection, she responded: "It works more on the left side than the right side of my body." A close neurological examination showed an apparent left handgrip weakness (30% or less by estimation). An old right focal lesion was noted by CT scans (Figure 1). Diffusion-weighted imaging (DWI) revealed no new findings. The patient reported symptoms improving in the next 2 hours and a full recovery in 3 hours. The operation was rescheduled. One week later the patient underwent endotracheal general anesthesia induced by 150 mg IV propofol and maintained with sevoflurane/nitrous oxide/oxygen mixture and 100 mcg fentanyl. Left-hand monoparesis did not recur. She was

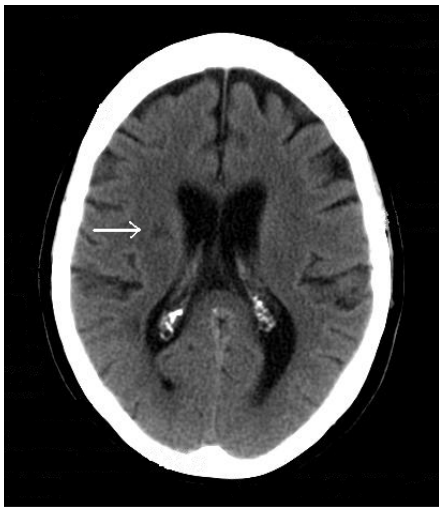

Figure 1 The CT scan of Patient 2, old ischaemic lesion, right side (arrowed).

discharged home, and a phone follow-up 24 hours later showed no complications.

Discussion

The unusual features of these 2 cases were the transient "unilateral effects" following IV midazolam injection in the ambulatory surgical setting. They had no clear neurological histories. In case 1, the patient described a subjective unilateral sensory effect, whereas in case 2 a post-sedation unilateral motor deficit was found. Further neurological exams and neuroimaging revealed old brain lesions in cases 2, but not in case 1. However, when endotracheal general anesthesia proceeded, there was no re-emergence of the neurological deficits previously induced by midazolam. We reviewed the literature and try to conceptualize the main reasons behind these unusual findings.

First, a neurotransmitter mechanism is inferred for these self-limiting unilateral effects following midazolam injection. Midazolam (2,3) is a gamma-aminobutyric acid type A (GABAa) receptor agonist that potentiates the activities of GABA, the predominant central nervous system inhibitory neurotransmitter at the GABAa receptors that are widely distributed throughout the brain. Lazar et al. find that patients with histories of TIA or stroke show reemergence of TIA after administration of midazolam in a dose that produces light sedation and all recover within 2 hours [2,3]. However, our cases are unexpected, without neurological history. Thal et al. [4] report 54 patients with previous TIA in whom briefly unmasked focal motor deficits are found when sedated with midazolam or fentanyl. These findings suggest that the reemergence of TIA phenomenon is not specifically from a particular class of sedative but a general property of centrally acting compounds (diazepam, (5) sufentanil, (6) fentanyl, (4) midazolam (2,3)).

Second, the patient may have a previous silent stroke (infarcts on CT scan but no symptoms [7] that remained unnoticed as in case 2 (Figure 1), since she too has increased risks for stroke [8] such as cigarette smoking, hypertension, diabetes mellitus, ischemic heart diseases, obesity, and cardiac surgery and since silent stroke is observed in just 13% of patients with TIA or minor ischemic stroke and has no residual deficit after the qualifying event [7]. The second possibility is that the presumed lesion remained undetected by imaging as in case 1; diffusion MRI reveals clinically relevant focal abnormalities in just 48% of TIA's [9]. Furthermore, it is also possible that one may suffer from a brand new perioperative stroke lesion; up to 45% of the patients after cardiac surgery acquire new ischemic brain lesions that are sub-clinical [10]. Table 1 summarizes perioperative brain ischemia risks with sedation or general anesthesia. Patients with previous strokes undergo general anesthesia increase brain ischemia rate to 1.5 – 2.9% [11]. The incidence of perioperative TIA is as high as 100% (2-4) when challenged previous TIA or stroke patients with midazolam or fentanyl for sedation.

Third, the diseased hemisphere may be more sensitive to midazolam per se during hypercapnia. During hypercapnia, specifically as a result of midazolam induced poor-ventilation [22] during premedication in these 2 cases, the brain's GABAergic activities are prone to changes in CO2 levels [13].

Fourth, we find that explanation by hypoventilation [12] and reduced cerebral blood flow to hypercapnia [14] of corresponding cerebral territories can not be excluded. When the subclinically diseased/injured/degenerated hemisphere [2–4] affected by hypoventilation and hypercapnia during respiratory depression following midazolam injection, [12] there is a subsequent unbalanced reduction of cerebral blood flow on the diseased side resulting in "differential effect" between the 2 hemispheres [15,16]. Normally, the addition of CO_2 to the inhaled anesthetic mixture is followed by cerebral vasodilation and increased cerebral blood flow in a non-diseased brain. However, using positron emission tomography, Levine et al. are able to demonstrate in TIA patients that the cerebral blood flows on injured hemispheres become significantly lower than the normal side possibly due to a steal phenomenon [14]. Although the findings in these two cases cannot be explained merely by effects of general sedation [2], they imply "improved ventilation" under general anesthesia somehow relieves the hypoventilation related hypercapnia and thus mitigates the brain's differential hypoperfusion response.

Table 1 Summary of reported perioperative risks of TIA.

Sedation	Reported risk rate
11 patients studied by Lazar et al.: midazolam challenge the transient revelation of resolved prior motor deficit (2,3)	100%
54 patients studied by Thal et al.: midazolam or fentanyl challenge the transient revelation of resolved prior motor deficit (4)	73%
General Anesthesia	Reported Risk Rate
Cardiac surgery (7)	45%
Advanced age, over 80 for surgery (8)	3.2%
General surgery with a history of previous stroke (11)	2.9%
General anesthesia with a history of previous brain ischemia (11)	1.5-2.9%
History of diabetes, hypertension, and smoking (8)	Increased
General anesthesia for non-vascular surgery (8)	0.08-0.7%

The main limitation of this report is a paucity of cases, especially patients with previously unnoticed or undetectable (silent) stroke. Nevertheless, this report sheds light to clinicians to conceptualize how these unexpected and self-limiting situations occur and manage them accordingly.

Conclusion

We describe 2 patients in whom there were no previous histories of neurological deficits, yet they developed monoparesis following IV midazolam injection and without reemergence after subsequent endotracheal general anesthesia. We believe that the decreased cerebral blood flow due to sedation-related hypercapnia and increased sensitivity to midazolam on the injured hemisphere play roles in these unilateral events. Good ventilation and hydration are essential to mitigate these unilateral effects. The transient pharmacological effect should resolve over time. A thorough exclusion of new neurological lesions is crucial since these patients are at increased risk for recurrent TIA or major stroke in the future.

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Conflict of interest: None.

Ethical standards: The authors confirm that the patients in these case reports gave their informed consent.

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Ten Year Performance of Ambulatory Surgery in England

Mark Skues[1], Ian Jackson[2]

Abstract

Introduction: The development of a new cohort of procedures suitable for Ambulatory Surgery has been recently mooted by the International Association of Ambulatory Surgery. This paper describes a ten year audit of performance of such operations in England, calculating rates for admission, treatment and discharge over the same calendar day.

Methods: Data were extrapolated from NHS Digital information for the years 2006-7 to 2016-17, by subtracting emergency operations from the total number of finished consultant episodes, and then calculating the ambulatory surgery rate.

Results: There has been a consistent increase in the rates of ambulatory surgery for the periods evaluated. Procedures can be divided into "mature", "rapidly rising" and "low threshold" categories, dependent upon their relative rates.

Conclusion: Retrospective audit of ambulatory surgery performance allows assessment of national status to facilitate further development of the speciality.

Keywords: Ambulatory Surgery, Performance, England.

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Introduction

Ambulatory Surgery is a pathway of care that offers efficiency, economy, timeliness, with morbidity and mortality rates below that of inpatient management. Appleby [1] cites that the English performance of Day Surgery has saved the National Health Service over two billion pounds in the cost of treating 6.96 million patients, with a further 1.5 million patients being treated over the next decade for no real increase in spending. In previous years, the International Association for Ambulatory Surgery has attempted to complete international reviews of ambulatory surgery rates to allow comparison between countries. The first of these was carried out for 1994-1995 [2] and included 20 procedures deemed suitable for inclusion. (Table 1).

The same procedures were considered for 1996–1997 [3], then in the next audit for 2003 (4), Toftgaard considered it appropriate to extend the cohort to 37 procedures as a consequence of the further development of ambulatory surgery, as well as the need to include more surgical specialities in the list. (Table 2).

Such audit continued for 2009 [5] and for 2011 [6], though, with only six European countries participating.

In 2017, Jackson [7] presented proposals for an updated list of procedures deemed suitable for review of outcome. The proposed list was designed to deal with some of the issues perceived to be limiting the ability of countries to take part, including

- the ongoing development of ambulatory surgery with translocation of some operations to the outpatient environment,
- remove vagueness in definition of some previous procedures used,
- remove procedures that may not be routinely available in some countries, thereby limiting uptake.

Potential operations were classified by surgical speciality, with three procedures listed as specialist surgery. (Table 3).

To test the changes in procedures used for this proposed international comparison

Table 1 Procedures for Audit.

Knee Arthroscopy	Extraction of impacted tooth
Cataract Surgery	Inguinal and Femoral Hernia repair
Dilatation and Curettage of uterus	Vein Ligation and stripping
Tonsillectomy with or without adenoidectomy	Myringotomy (with tube insertion)
Squint Surgery	Laparoscopic sterilization
Excision of breast lump	Submucous resection of nose
Anal procedures	Circumcision
Carpal tunnel decompression	Dupuytren's contracture
Vaginal Hysterectomy	Orchidopexy /varicocoele
Removal of bone implant	Laparoscopic Cholecystectomy

Table 2 Additional Procedures.

Rhinoplasty	Broncho-Mediastinoscopy
Termination of Pregnancy	Hysterectomy (Laparoscopic Assisted)
Repair of cystocole/rectocoele	Arthroscopic meniscectomy
Repair of deformity of foot	Disc operations
Mastectomy	Laparoscopic antireflux surgery
Haemorrhoidectomy	Male sterilisation
Transurethral resection of prostate	Bilateral breast reduction
Abdominoplasty	Pilonidal cyst excision
Colonoscopy	Removal of colon polyps
Baker's Cyst	

Table 3 IAAS Cohort of Ambulatory Surgery Procedures for 2017.

Orthopaedic: Knee arthroscopy including meniscectomy, meniscal or other repair; Removal of bone implants (removal of internal fixation from bone / joint excluding K-wires); Bunion operations with or without internal fixation and soft tissue correction; Carpal Tunnel Release; Dupuytren's fasciectomy
General Surgery: Laparoscopic Cholecystectomy; Laparoscopic repair of hiatus hernia with anti-reflux procedure (eg fundoplication); Haemorrhoidectomy; Primary inguinal hernia repair
Breast surgery: Wide local excision of breast with or without axillary node biopsy; Mastectomy with or without axillary node biopsy
Urology: Orchidopexy, Endoscopic resection of prostate (TUR) – can include laser surgery; Endoscopic excision of lesion of bladder
Specialist surgery: Hemithyroidectomy; partial thyroidectomy; posterior excision of lumbar disc prolapse including microdiscectomy

To test the changes in procedures used for this proposed international comparison data for England were extracted from national datasets for the year April 2016-March 2017, and collated for the previous ten years, to review the performance of ambulatory surgery in this country.

Methods

For each of the procedures specified, cross-checking with the BADS Directory of Procedures [8] facilitated the identification of four digit OPCS codes (version 4.8) for therapeutic operations, from which online databases at NHS Digital were searched for the relevant procedures [9]. The information within this datset contains the number of finished consultant episodes, number of emergency procedures, and the number that were conducted as daycases for each financial year. In the UK, daycases are defined as patients who undergo admission for a surgical procedure and are discharged before midnight on the same calendar day.

The daycase percentage was calculated as the total number of daycases divided by the total number of finished consultant episodes less the number of emergency procedures for this operation or:

$$\frac{\text{Annual number of Daycases}}{\text{(Annual number of FCEs – Annual number of Emergencies)}} \times 100$$

NHS Digital datasets from 2013–14 to 2016–17 also contain a number of "zero length" stays. These are episodes where the patient was admitted and discharged on the same calendar day, but no prior management intent was provided to inform that the patient would be managed on an ambulatory basis. These data were omitted from calculations, recognising that they might undervalue the overall percentage for ambulatory information for these particular years, but would affect the overall consistency of the ten-year cohort that was studied.

Results

Table 4 shows the results of the 10-year audit for the relevant ambulatory operations. Overall, there has been a progressive increase in the rate of all procedures, with a number of defining guidelines.

1) "Mature" procedures. These are operations where the baseline figure has been high, and little further progression has been made in the rate of day surgery as a result of co-morbidities in the remaining patient cohort that limit further expansion.
2) "Rapidly rising" procedures, where there has been a generalised acceptance of the feasibility of ambulatory surgery in the operations cited, and there has been a progressive increase in the numbers recorded as day surgery.
3) "Low threshold" operations that have risen slowly from a low baseline for which there is additional opportunity to improve daycase rates, but there may be other constraints that limit uptake to an ambulatory environment.

Discussion

This paper describes what is believed to be the first review of the percentage of ambulatory procedures conducted in one country over a ten-year period. The data demonstrates an increase in all procedures reviewed, with predicted expectations matching reality. There have been a number of developments within the NHS in England that may have influenced progress with the IAAS cohort of procedures, notably, the development of a financially incentivised system where certain procedures (Laparoscopic Cholecystectomy, Inguinal Hernia Repair, Tonsillectomy, Dupuytren's Contracture) have benefitted from an increase in payment if they are carried out as an ambulatory procedure, with pre-confirmed management intent. This means that when patients are admitted, treated and discharged on the same calendar day, and their management is pre-planned as an ambulatory procedure, their care attracts an additional £200–£250 payment to the hospital. (€225–€285, $284–$355). Given that England was the only country in the United Kingdom to implement "Payment by Results", it seemed sensible to limit the audit to this country alone. Similarly, England is the only country that publishes such information on-line in the depth needed to conduct such an audit.

Reference has been made to the three types of procedure with varying ambulatory surgery rates. "Mature" procedures are those for which rates were historically high and reaching a level from which it might be difficult to expand any further. Such examples might have current rates of greater than 90%, for example, cataract extraction with intra-ocular lens insertion (98.4%), squint correction (93.2%) myringotomy (92.1%), carpal tunnel release (97.4%), and Dupuytren's fasciectomy (91.7%). While there might be further improvement in future years, the rate of rise is likely to be small.

The "rapidly rising" procedures are those where the annual rate of rise has been between 1% and 5%, and in due course, might flatten such improvement as they reach their relative maxima. Constraints might be the number of emergency procedures (for example, acute cholecystitis requiring laparoscopic cholecystectomy), the availability of suitable operating slots within the morning or early afternoon to facilitate the recovery of patients undergoing more complex ambulatory procedures, or the absolute number of individual operations requiring treatment, for which available capacity in the ambulatory area might be limited.

The "low threshold" procedures are those with a low or very low

Table 4 Ambulatory Performance for the IAAS cohort in England from 2007–08 to 2016–17.

Procedure	2016–17	2015–16	2014–15	2013–14	2012–13	2011–12	2010–°11	2009–10	2008–09	2007–08
Cataract extraction + IOL	98.4%	98.7%	97.5%	97.0%	98.5%	98.3%	98.2%	97.5%	97.2%	95.9%
Correction of squint	93.2%	92.6%	93.1%	93.6%	94.2%	94.4%	93.2%	92.3%	91.3%	91.8%
Myringotomy with or without insertion of tube/suction clearance with tube insertion	92.1%	92.6%	91.2%	91.5%	91.4%	91.3%	89.9%	88.3%	87.6%	86.9%
Tonsillectomy	56.0%	53.9%	50.3%	46.2%	42.8%	37.9%	32.9%	29.9%	26.9%	23.6%
Septorhinoplasty	58.6%	54.3%	49.1%	43.8%	40.9%	37.4%	32.5%	27.2%	24.7%	21.0%
Vaginal hysterectomy including laparoscopic assisted	1.1%	1.3%	0.8%	0.9%	0.6%	0.5%	0.4%	0.3%	0.5%	0.2%
Laparoscopic abdominal hysterectomy	0.7%	0.7%	0.6%	0.3%	0.2%	0.2%	0.2%	0.3%	0.5%	0.2%
Repair of cysto- and rectocoele (anterior and posterior colporrhaphy)	5.1%	4.7%	3.7%	3.0%	2.9%	2.2%	1.7%	1.4%	1.4%	1.1%
Knee arthroscopy including meniscectomy, meniscal or other repair	85.8%	86.1%	79.6%	79.8%	84.5%	83.7%	81.8%	79.5%	76.0%	68.2%
Removal of bone implants (removal of internal fixation from bone / joint excluding K-wires)	74.8%	74.4%	72.9%	71.6%	70.8%	69.1%	66.5%	65.0%	63.1%	61.0%
Bunion operations with or without internal fixation and soft tissue correction	70.8%	69.1%	63.8%	60.4%	60.5%	57.2%	54.2%	49.0%	45.1%	37.7%
Carpal Tunnel Release	97.4%	97.6%	94.0%	94.3%	97.1%	96.6%	95.9%	95.4%	94.6%	91.8%
Dupuytren's fasciectomy	91.7%	91.0%	86.4%	84.8%	85.5%	81.8%	76.7%	71.9%	69.7%	62.5%
Laparoscopic Cholecystectomy	52.8%	51.3%	47.3%	43.7%	40.2%	35.3%	29.5%	21.7%	18.2%	15.8%
Laparoscopic repair of hiatus hernia with anti-reflux procedure (eg fundoplication)	10.2%	10.2%	7.7%	5.1%	5.4%	3.7%	3.8%	3.9%	4.3%	4.7%
Haemorrhoidectomy	79.0%	77.3%	73.9%	71.7%	70.9%	67.0%	60.5%	56.3%	52.6%	47.9%
Primary inguinal hernia repair	75.4%	74.3%	70.4%	69.0%	70.1%	67.6%	64.0%	61.2%	59.9%	58.2%
Wide local excision of breast with or without axillary node biopsy	64.5%	62.2%	57.3%	55.1%	47.6%	37.4%	27.4%	21.5%	18.3%	13.6%

(Table continues overleaf)

Table 4 Ambulatory Performance for the IAAS cohort in England from 2007–08 to 2016–17. (*cont'd*)

Procedure	2016–17	2015–16	2014–15	2013–14	2012–13	2011–12	2010–°11	2009–10	2008–09	2007–08
Mastectomy with or without axillary node biopsy	10.8%	8.9%	7.3%	7.1%	5.9%	3.8%	3.2%	3.1%	2.8%	2.7%
Orchidopexy	88.7%	88.0%	87.4%	87.9%	88.8%	88.3%	86.3%	85.0%	83.1%	82.8%
Endoscopic resection of prostate (TUR) – can include laser surgery	5.7%	5.8%	4.8%	3.8%	3.0%	2.7%	2.0%	2.3%	1.8%	2.3%
Endoscopic excision of lesion of bladder	28.4%	27.3%	27.0%	26.9%	27.8%	28.2%	27.0%	25.2%	24.3%	22.7%
Hemithyroidectomy	3.8%	3.5%	4.5%	3.2%	3.3%	3.0%	2.2%	1.2%	1.6%	2.2%
Partial thyroidectomy	7.3%	6.3%	5.9%	6.2%	6.6%	6.1%	5.1%	3.1%	3.2%	2.8%
Posterior excision of lumbar disc prolapse including microdiscectomy	8.7%	7.5%	5.9%	4.6%	4.5%	3.5%	3.2%	2.5%	2.2%	2.4%

baseline, that have increased slowly over the period of audit. Such examples within the IAAS cohort would be laparoscopic assisted abdominal or vaginal hysterectomy, mastectomy, resection of prostate gland with or without the use of laser equipment, and hemithyroidectomy. Mastectomy is a procedure that has been incentivised under the 'Best Practice Tariff' scheme, and has been the subject of a number of meetings arranged by the British Association of Day Surgery [10], as well as the target of work conducted by NHS Improvement [11]. Thyroid surgery has previously been of contention as a procedure suitable for daycase surgery. A previous review in 2012 [12] questioned the wisdom of such surgery on the basis of safety, given the risk of post-operative haemorrhage. Wood and McLaren presented a seven year series of 215 thyroid lobectomies in 2015 [13], 194 (90%) of whom were discharged on the same day. The authors made note of their meticulous haemostasis with the combination of diathermy and the harmonic scalpel, avoidance of strap muscle division, resulting in only one patient in the immediate post-operative period requiring re-exploration for a superficial bleeding point.

Where does England stand in comparison with other countries? Recent papers from France [14,15] have described information regarding day surgery performance for 10 surgical procedures, but the studied cohort was a subset of the total number of hospitals in France [15], and the operations studied were different from the proposed IAAS cohort. There seems to have been little other recent information disseminated, with the exception of Belgium [16], where ambulatory surgery rates have been published. The Belgian data provide cross comparisons with other European countries for a number of surgical procedures that have been already alluded to, particularly in relation to laparoscopic cholecystectomy [17]. While it is not the role of this paper to make comparisons between different countries on information that may be several years old, England does seem to be performing well in the ongoing development of ambulatory surgery, despite nationally voiced concerns regarding paucity of funding for the National Health Service. We therefore look forward to the development and dissemination of similar data from other countries to allow more accurate comparison.

Conclusion

The use of retrospective audit data reviewing the national performance of ambulatory surgery is valuable, allowing comparison of both high and low percentage procedures and developing strategies to influence future rates. The publication of similar information from other countries will assist cross-comparison, allowing the focus of support facilities to those areas where greatest benefit may accrue.

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