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## Reports of Investigation

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# Unanticipated admission after ambulatory surgery – a prospective study

Joanne Fortier MD FRCPC,\*  
Frances Chung MD FRCPC,†  
Jun Su MD†

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**Purpose:** To determine the incidence, the reasons, and the predictive factors for unanticipated admission after ambulatory surgery.

**Methods:** Preoperative, intraoperative, and postoperative data were collected prospectively on 15,172 consecutive ambulatory surgical patients during a 32-month period. The data were built into a statistical model, and predictive factors were identified and classified.

**Results:** The overall incidence of unanticipated admission was 1.42%. Admitted patients were more likely to be older, male, and ASA status II or III. Duration of anaesthesia was longer, and surgery was more likely to be completed after 3 pm. Length of stay in the Postanaesthesia Care Unit and the Ambulatory Surgery Unit was longer. Surgical reasons were cited in 38.1% of admitted patients; anaesthesia-related reasons were cited in 25%; social reasons accounted for 19.5%, and medical reasons for 17.2%. Ear, nose and throat (ENT) patients had the highest unanticipated admission rate (18.2%), followed by urology (4.8%) and chronic pain block (3.9%). Gynaecological patients had the lowest rate (0.4%). Among the predictive factors found were male, ASA status II and III, long duration of surgery, surgery finishing after 3 pm, postoperative bleeding, excessive pain, nausea and vomiting, and excessive drowsiness or dizziness.

**Conclusion:** Earlier operating time for certain surgical procedures, screening for proper support at home, and implementation of clinical pathways to deal aggressively with problems such as pain, nausea and vomiting should decrease the incidence of unanticipated admission.

**Objectif :** Déterminer l'incidence, les raisons et les facteurs prédictifs d'une admission non prévue à la suite d'une chirurgie ambulatoire.

**Méthode :** Les données préopératoires, intraopératoires et postopératoires ont été recueillies pendant 32 mois de façon prospective auprès de 15 172 patients consécutifs, à la suite d'une chirurgie ambulatoire. Ces données ont été intégrées à un modèle statistique et les facteurs prédictifs ont été identifiés et classifiés.

**Résultats :** L'incidence totale d'admission imprévue était de 1,42 %. Les patients admis étaient plus susceptibles d'être âgés, de sexe mâle et d'état ASA II ou III. La durée de l'anesthésie était longue et plus susceptible de se prolonger après 15 h. Les séjours à l'unité des soins postanesthésiques et à l'unité de chirurgie ambulatoire étaient prolongés. Les raisons chirurgicales ont été invoquées pour 38,1 % des patients admis ; les raisons reliées à l'anesthésie pour 25 % ; les raisons sociales pour 19,5 % et les raisons médicales pour 17,2 %. Les patients d'oto-rhino-laryngologie (ORL) ont présenté le plus haut taux d'admission non planifiée (18,2 %) suivis des patients d'urologie (4,8 %) et de ceux qui avaient reçu un bloc thérapeutique pour douleurs chroniques (3,9 %). Les patientes de gynécologie avaient le taux le plus bas (0,4 %). Parmi les facteurs prédictifs identifiés, on a trouvé le sexe mâle, l'état ASA II et III, une chirurgie de durée prolongée, une chirurgie qui se termine après 15 h, les saignements postopératoires, la douleur excessive, les nausées et les vomissements, une grande somnolence et des étourdissements importants.

**Conclusion :** Le fait de procéder plus tôt dans la journée à certaines interventions chirurgicales, le dépistage préalable d'un soutien approprié pour le patient à domicile et la mise en application des moyens cliniques permettant de s'occuper énergiquement des effets secondaires comme la douleur et, les nausées et vomissements devraient diminuer l'incidence de l'admission non prévue.

From the Departments of Anaesthesia, CHUM-Hotel-Dieu Campus,\* University of Montreal, and Toronto Hospital,† University of Toronto, Toronto, Ontario, Canada.

Address correspondence to: Dr. Frances Chung, Department of Anaesthesia, Toronto Hospital, Western Division, University of Toronto, 399 Bathurst St., Toronto, Ontario, Canada M5T 2S8. Phone: 416-603-5118; Fax: 416-603-6494.

Accepted for publication February 24, 1998.

**A**MBULATORY surgery accounts for a large and ever-increasing share of surgical procedures. In ambulatory anaesthesia, quality care is a primary concern, but defining good care is a challenge. Unanticipated admission after ambulatory surgery is an indicator of quality care because it concerns the basic goal of same-day discharge.

The incidence of unanticipated admission after ambulatory surgery varies from 0.28% to 9.5%.<sup>1-6</sup> Predictive factors are general anaesthesia, emesis, lower abdominal surgery, urological procedures, and anaesthesia duration of more than one hour; pain, bleeding, more extensive surgery, and social reasons account for most of the unanticipated admissions.

Because there has been no large prospective study that examined the reasons and predictive factors for unanticipated admission of ambulatory surgical patients, we studied prospectively the incidence, causes, and predictive factors for unanticipated admission in our patient population.

## Methods

### *Facilities*

With the approval of our institutional Ethics Committee, data were prospectively collected on consecutive ambulatory surgical patients registered at the Toronto Hospital, Western Division, a tertiary care teaching hospital. No informed consent was required for this study as there was no change in routine practice. The ambulatory surgery facilities consist of an admissions area, four outpatient operating rooms, an outpatient Postanaesthesia Care Unit (PACU), and an Ambulatory Surgical Unit (ASU). This facility was separate from the inpatient operating rooms. All patients in the ambulatory surgical facility were discharged on the same day as surgery. Overnight stay by patients from the ambulatory programme was considered an unanticipated admission. Healthy ASA I patients were not evaluated preoperatively in the anaesthesia consultation clinic. Most patients with ASA status II and all ASA status III were evaluated in the anaesthesia consultation clinic preoperatively.

### *Data collection*

The following variables were studied prospectively: preoperative patient characteristics; intraoperative variables and adverse outcomes; and postoperative variables and adverse outcomes. These variables were documented in the anaesthesia, PACU, and ASU records and on a standardized adverse outcome check-off form. The anaesthetists completed the anaesthetic record in a check-off format. Demographic data, preoperative medical illness, American Society of

Anesthesiology (ASA) status, duration of anaesthesia, surgical procedure, and intraoperative management (drugs, techniques, monitoring, etc.) were documented in the anaesthetic record.

The surgical procedures were classified according to the International Classification of Diseases Procedure Code (ICD.9.CM) and recorded as one of nine groups: ear, nose, throat and dental; general surgery; urology; neurosurgery; gynaecology; plastic surgery; ophthalmology; orthopaedic; and chronic pain block. Types of anaesthesia were classified into five groups: general anaesthesia, monitored anaesthesia care, regional anaesthesia, local anaesthesia, and chronic pain block. Travel time (reflecting the distance the patient needed to travel to the hospital) was divided into areas inside or outside the metropolitan Toronto area, i.e., less than or more than one hour. The time of completion of surgery was classified as morning (8:00-11:59), afternoon (12:00-2:59 pm), or late afternoon (> 3:00 pm).

Intraoperative and immediate postoperative adverse outcomes, with printed concise definitions, were documented in a standardized adverse outcome check-off form. Both anaesthetists and nurses were instructed in the standardized definitions and recording of variables before the start of the study. Intraoperatively, the anaesthetists checked off adverse outcomes, and the form accompanied the patient into the PACU and ASU, where the nursing staff recorded adverse outcomes in categories listed on the form. Postoperatively, patients who had general or regional anaesthesia were admitted to the PACU and then to the ASU. Most patients with local anaesthesia or monitored anaesthesia care went directly to the ASU. Medications given, physiological variables, duration of stay in the PACU and ASU, and discharge location were recorded in the specifically designed PACU and ASU records. Patients were discharged when they achieved a score of 9 on the Post Anaesthesia Discharge Scoring System.<sup>7</sup>

### *Unanticipated admission*

If the patient required admission, the nurses in the PACU or the ASU checked off the reason and document the details on the standardized adverse outcome check-off form. The decision to admit the patients was made by the surgeons or the anaesthetists in charge. The reason for unanticipated admission was classified on the adverse outcome form into one of four main groups: surgical reasons including pain, bleeding, positive biopsy, misadventure, and more extensive surgery; Anaesthesia reasons included nausea and vomiting, dizziness, and somnolence; Medical reasons included preexisting disease and various complications; Social reasons included patient request, surgeon request, and no available escort.

Charting was completed on discharge from the ASU, and the data were reviewed systematically the next day by a research assistant and an experienced anaesthetist (FC). The data were coded and entered into a Dbase III+ computer programme.

#### Data analysis

Data were analyzed employing the Statistical Analysis System (SAS) version 6.11. Descriptive statistics in the form of frequencies, means, standard deviations, and percentages were calculated. For continuous variables, independent *t* tests were used to test the differences between the unanticipated admission group and the same-day discharge group. For categorical variables, the chi-square test of independence was used.

In order to identify predictive factors for unanticipated admission, a two-stage analysis was carried out. First, univariable logistic regression models were used to determine which individual factors were associated with unanticipated admission. Second, all variables with statistically significant association with unanticipated admission from the first step were simultaneously built into a multivariable logistic regression model. The purpose of the second step was to get an adjusted effect estimate for the different factors, controlling for the potentially confounding effect of the other variables in the model. ASA physical status was used as a variable instead of the large number of preexisting medical diseases. The type of anaesthesia was not included in the model since in a clinical setting it is dependent on the type of surgery. Odds ratios, their 95% confidence limits, and the corresponding *P*-values were reported for all significant predictive factors from the second model. Because of the large data set, in addition to a statistically significant *P* value of  $<0.05$ , the odds ratio had to be either  $<0.9$  or  $>1.1$  to be considered significant.

#### Results

Of 15,179 ambulatory surgical patients, 215 (1.42%) were admitted. Patients with unanticipated admission were older and more likely to be male than female (Table I). Patients of ASA status II and III were more likely to be admitted than those of ASA status I. Body mass index was lower in the unanticipated admission group. In the same-day discharge and unanticipated admission groups, there were similar numbers of patients who lived more than one hour away.

The duration of anaesthesia was 35 min longer in patients with unanticipated admission. The incidence of unanticipated admission in patients whose surgical procedures ended after 3 pm was higher (Figure 1). In the unanticipated admission group, the length of stay in the PACU was 50 min longer and in the ASU 68

min longer. Most patients (165/215) with unanticipated admission were discharged the next day; the mean length of hospital stay was 1.4 days.

Reasons for unanticipated admission were divided into four categories: surgical, anaesthesia-related, medical, and social (Table II). Surgical reasons were the most frequent (38.1%). Anaesthesia-related reasons were cited in 25.1% of unanticipated admissions. Social reasons accounted for 19.5% of unanticipated admissions, and medical reasons were cited in 17.2% of cases (Table II).

For the types of anaesthesia, the highest unanticipated admission rate was for chronic pain block ( $n = 153$ ) at 3.9%, followed by local anaesthesia ( $n = 465$ ) at 2.8%. The unanticipated admission rate was 2.6% for regional anaesthesia ( $n = 304$ ), 1.6% for general anaesthesia ( $n = 8,805$ ), and 0.9% for monitored anaesthesia care ( $n = 5,452$ ). The incidence of unan-

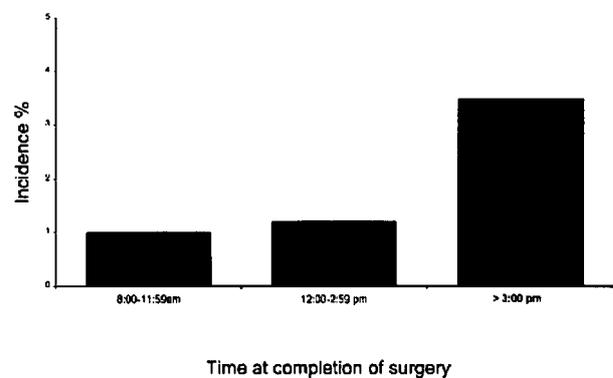


FIGURE 1 Incidence of unanticipated admission after various times of completion of surgery.

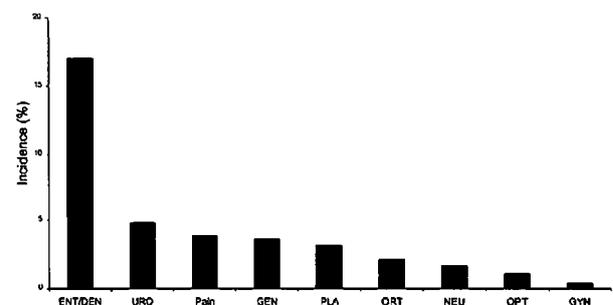


FIGURE 2 Incidence of unanticipated admission after various types of surgery. ENT/DEN, ear, nose and throat or dental; URO, urology; Pain, chronic pain block; PLA, plastic surgery; ORT, orthopaedic; GEN, general; NEU, neurosurgery; OPT, ophthalmology; GYN, gynaecology.

TABLE I Characteristics of patients studied

Variable	Same-day discharge ( <i>n</i> =14,964)			Unanticipated admission ( <i>n</i> =215)		
	I	II	III	I	II	III
Sex	M 32 : F 68			M 43.3 : F 56.7*		
Age, yr	46 ± 21			51 ± 20†		
Body mass index, kg·m <sup>-2</sup>	2.5 ± 0.5			2.4 ± 0.5*		
ASA status	53.9	40.1	6.0	34.9	53.0*	12.1*
Distance traveled	≤ 1 hr		> 1 hr	≤ 1 hr	> 1 hr	
	85.1		14.9	80.3	19.7	
Anaesthesia duration, min	49.6 ± 26			84.8 ± 47*		
End of surgery	< 3 PM		> 3 PM	< 3 PM	> 3 PM	
	91.7		8.3	77.6	22.4*	
PACU duration, min	50.0 ± 24			100.4 ± 68*		
ASU duration, min	98.8 ± 55			166.2 ± 95*		

Sex, ASA status, distance traveled, and end of surgery are expressed as percentages. Age, body mass index, anaesthesia duration, and PACU and ASU duration are expressed as mean ± SD. Significantly different from same-day discharge: \**P* < 0.001, †*P* < 0.002.

anticipated admission after chronic pain block (*P* < 0.001), local anaesthesia (*P* < 0.001), regional anaesthesia (*P* < 0.001) or general anaesthesia (*P* < 0.004) was higher than that for monitored anaesthesia care.

The incidence of unanticipated admission by type of surgical procedure is shown in Table III. The highest rate (18.2%) occurred with ENT surgery, followed by urology (4.8%) and chronic pain block (3.9%). Gynaecology had the lowest rate (0.4%) (Figure 2). The caseload distribution (Table III) showed that ophthalmology accounted for the most cases at 36%; gynaecology, 34%; and orthopaedics, 17%.

First-stage analysis of predictive factors showed that sex was a significant factor, with men more likely than women to be admitted (Table IV). A lower body mass index was significant. ASA physical status II and III patients were admitted more than ASA physical status I patients. Age and travel time of > one hour were not significant. The presence of preoperative disease was analysed with each factor. Heart disease, asthma, diabetes, hypertension, and hyperthyroidism/hypothyroidism were significant factors, but smoking and history of chronic obstructive pulmonary disease were not.

When we compared surgical groups, the default used was gynaecology, because it had the lowest admission rate. All groups were considered significant but with varied odds ratios. Patients with all types of anaesthesia were admitted more often than patients with monitored anaesthesia care. Duration of anaesthesia was a significant factor, as was completion of surgery after 3 pm when compared with the morning (8 am - 12 pm) or early afternoon (12 pm - 3 pm) groups. Postoperative pain, nausea and vomiting, dizziness, drowsiness, and especially bleeding were all significant predictors of unanticipated admissions.

Further analysis and creation of statistical predictive models for preoperative, intraoperative, and postoperative periods confirmed that the following factors were predictive (Table V). For preoperative factors, male sex and ASA physical status II and III were found to be significant. Intraoperative factors showed that certain surgical specialties – ENT, urology, plastic surgery, orthopaedics, neurosurgery, and ophthalmology – to be significant predictors. Longer duration of anaesthesia was significant, and end of procedure after 3 pm was also a predictive factor. Postoperative predictive factors of unanticipated admission included bleeding, severe pain, nausea and vomiting, excessive drowsiness, and dizziness.

## Discussion

The overall unanticipated admission rate of 1.42% in our study compares well with results from the other large series of patients studied.<sup>1,3-6,8,9</sup> With Medicare in Canada, admitting a patient to hospital does not result in direct cost to the patient or potential reimbursement problems with insurance companies. Also, our hospital is a large teaching centre with beds readily available. These two factors might have boosted the incidence of unanticipated admission, and the 20% of admissions for social reasons reflect this. Therefore, there is ample room for improvement in decreasing the incidence of unanticipated admission. Better preoperative screening and education of patients, family, and surgeons can significantly reduce the incidence.

Nausea and vomiting accounted for 14.4% of unanticipated admissions, confirming the findings in previous studies.<sup>3,10-13</sup> During the study period, no routine antiemetic prophylaxis was used. In addition, ondansetron was not available as a routine treatment.

TABLE II Reasons for unanticipated admission (215 patients)

<b>SURGICAL: n = 82 (38.1%)</b>	<b>ANAESTHETIC: n = 54 (25.1%)</b>
<p><i>Pain</i> n = 26 (12.1%)            15 orthopaedic surgery            4 plastic surgery            2 peripheral nerve surgery            1 skin graft            1 ENT surgery            1 myomectomy            1 urology            1 chronic pain block</p> <p><i>Misadventure</i> n = 13 (6.0%)            6 haemorrhage in ophthalmology            4 pneumothorax after lung biopsy            1 failed laparoscopy            1 laparotomy for bleeding D&amp;C            1 spinal tap-dorsal column stimulator</p> <p><i>More Extensive Surgery</i> n = 7 (3.3%)            3 gynaec-ectopic-malignancy            2 knee surgery            1 shoulder surgery            1 hand surgery</p> <p><i>Other</i> n = 36 (16.7%)            16 bleeding            14 observation            5 postoperative care            1 unsuccessful nephrostomy tube</p>	<p><i>Nausea and Vomiting</i> n = 31 (14.4%)            9 ophthalmology (1 strabismus)            8 orthopaedic surgery            6 ENT surgery            4 gynaecology            2 peripheral nerve            1 general surgery            1 plastic surgery</p> <p><i>Somnolence</i> n = 5 (2.3%)            3 post general anaesthesia            2 oversedation during local anaesthesia</p> <p><i>Other</i> n = 18 (8.4%)            7 block related (5 pain block, 1 eye block, 1 intravenous block)            5 dizziness            4 possible aspiration            1 observation (malignant hyperthermia susceptible)            1 anaesthetist request</p>
<b>SOCIAL n = 42 (19.5%)</b>	<b>MEDICAL n = 37 (17.2%)</b>
<p><i>Patient Request</i> n = 13 (6.0%)  <i>Surgeon Request</i> n = 15 (7.0%)  <i>No Escort</i> n = 14 (6.5%)</p>	<p><i>Preexisting Disease</i> n = 21 (9.8%)            3 diabetes            3 angina            3 low saturation and lung disease            2 hypertension            2 seizure            2 sleep apnea + angina + diabetes            1 diabetes + hypertension            1 diabetes + dialysis            1 renal failure            1 bradycardia            1 Parkinson's            1 coagulopathy</p> <p><i>Complications</i> n = 14 (6.5%)            5 dysrhythmia            3 vagal reaction            2 low O<sub>2</sub> saturation            1 myocardial infarction            1 heart failure            1 hypertension            1 bronchospasm</p> <p><i>Other</i> n = 2 (0.9%)            2 anxiety</p>

TABLE III Incidence of unanticipated admission by surgical procedure

Surgical group	Total no. of cases	Unanticipated admission (n)	Unanticipated admission (%)
ENT and dental n = 170 (1.1%)			(17.1)
dental	16	1	6.3
ENT	154	28	18.2
Urology n = 231 (1.5%)			(4.8)
orchiopexy	7	0	0
circumcision	41	2	4.9
other*	183	9	4.9
Chronic pain block n = 153 (1%)	153	6	3.9
General n = 431 (2.8%)			(3.7)
anal	9	0	0
cholecystectomy	1	0	0
vein stripping	7	0	0
breast	209	1	0.5
skin	161	3	1.9
other*	44	4	9.1
Plastic: n = 496 (3.3%)			(3.2)
breast	31	0	0
hand	272	7	2.6
face	84	4	4.8
skin graft and other	109	5	4.6
Orthopaedic: = 2,548 (16.8%)			(2.2)
knee	1584	25	1.6
hardware removal	184	4	2.2
ankle	180	6	3.3
elbow	78	3	3.8
shoulder	319	13	4.0
hand	140	6	4.3
other	53	0	0
Neurosurgery: n = 412 (2.7%)			(1.7)
carpal tunnel	254	0	0
peripheral nerve	158	7	4.4
Ophthalmology: n = 5,510 (36.3%)			(1.1)
cataract	4023	39	1.0
strabismus	369	4	1.1
trabeculectomy	275	3	1.1
cornea	396	7	1.8
other	447	6	1.3
Gynaecology: n = 5,228 (34.4%)			(0.4)
Biopsy/repair	14	0	0
D&C diagnostic	272	0	0
D&C abortion	4099	11	0.3
laparoscopic diagnostic	386	3	0.8
laparoscopic sterilization	273	4	1.5
hysteroscopy	184	4	2.2

\*Other types are, for urology: cysto, turbt; general surgery: hernia, Hickmann line insertion/removal, lung biopsy; plastic surgery: repair and reconstruction of skin, lipectomy; orthopaedic: bunionectomy, bursectomy, muscle biopsy; ophthalmology: lens repositioning, eyelid procedure, dacryocystorhinostomy, pterygium excision, keratotomy, scleral buckle, vitrectomy, conjunctival cyst excision.

Pain was also an important factor, accounting for 12.1% of the unanticipated admissions; 60% of these were orthopaedic patients. In a previous study of 1,996 orthopaedic surgical patients, pain accounted for half of the unanticipated admissions.<sup>14</sup> Better management of postoperative nausea and vomiting and pain would dramatically decrease the incidence of unanticipated admissions.

In the category of social reasons for admission, the differences between patient request, surgeon request, and no escort are somewhat arbitrary, because patients

may ask the surgeon if they can stay overnight because they are alone at home. Still, the percentage was high and should decrease with better planning.

The single largest reason for admission was surgical, with almost half of the patients admitted for bleeding and almost as many for observation. Bleeding was a predictive factor for admission, confirming results of previous studies.<sup>1,3,6,8,9</sup> On our forms, one main reason for unanticipated admission had to be chosen. However, in clinical practice, a single factor may not be important enough to warrant admission but, com-

TABLE IV Univariate logistic regression of unanticipated admission

Factor	Pr (chi)	OR	CI (lower)	CI (upper)
Body mass index	0.0146	2.5	1.2	5.0
ASA status	0.0001	2.2	1.7	2.9
Sex	0.0005	0.6	0.5	0.8
Age	0.0023	1.0	1.0	1.0
Travel time > 1 hr	0.0520	1.4	0.1	2.0
Medical disease				
Asthma	0.0001	2.5	1.6	3.7
Diabetes	0.0022	2.0	1.3	3.2
Arteriosclerotic heart disease	0.0133	1.8	1.1	2.8
Hypertension	0.0020	1.7	1.2	2.4
Hyper/hypothyroidism	0.1045	1.6	0.9	2.6
Chronic obstructive lung disease	0.6831	1.1	0.8	1.6
Type of surgery *				
ENT and dental	0.0001	45.0	25.3	80.0
Urology	0.0001	11.3	5.5	23.5
Chronic pain block	0.0001	9.2	3.7	23.0
Plastic	0.0001	7.6	4.0	14.4
Orthopedic	0.0001	5.2	3.2	8.4
General	0.0004	4.3	1.9	9.6
Neurosurgery	0.0017	3.9	1.7	9.2
Ophthalmology	0.0003	2.5	1.5	4.0
Type of anaesthesia †				
Pain block	0.0007	4.4	1.96	10.5
Local	0.0003	3.1	1.7	5.8
Regional	0.0054	2.9	1.4	6.2
General	0.0011	1.7	1.2	2.4
Anaesthesia > 1 hr	0.0001	3.9	2.9	5.3
Surgery end > 3 pm	0.0001	3.2	2.3	4.5
Postoperative symptom				
Bleeding	0.0001	294.8	82.6	999.0
Drowsiness	0.0001	13.6	6.0	30.8
Nausea/vomiting	0.0001	6.8	4.9	9.4
Dizziness	0.0001	6.8	4.1	11.4
Pain	0.0001	5.7	4.2	7.9

Pr, probability; OR, odds ratio; CI, confidence interval.

\* Type of surgery was compared with gynecological disease.

† Type of anaesthesia was compared with monitored anaesthesia care.

bined with other minor factors, may justify it. Future studies should document multiple reasons for unanticipated admission.

To our knowledge, this is the first large prospective study to determine predictive factors for unanticipated admission and to distinguish among preoperative, intraoperative, and postoperative factors. Rudkin *et al.*<sup>5</sup> did a prospective study of 5,000 patients, but their emphasis was on preoperative screening. Maleness, ASA physical status, and surgery type were not found to be significant predictive factors in previous studies. Gold *et al.*<sup>3</sup> found general anaesthesia and age to be predictive factors, whereas we did not. However, we found that

TABLE V Significant predictors from the multivariable logistic regression of unanticipated admission

Factor	Pr	OR	CI
Preoperative			
ASA II and III	0.0001	2.1	1.5 - 2.8
Sex	0.0162	0.7	0.5 - 0.9
Intraoperative			
ENT	0.0001	29.6	15.1 - 58.1
Urology	0.0001	8.3	3.6 - 19.0
Plastic	0.0001	4.7	2.1 - 10.5
Orthopaedic	0.0001	4.3	2.5 - 7.4
Neurosurgery	0.0028	3.9	1.6 - 9.6
Ophthalmology	0.0175	1.9	1.1 - 3.4
Surgery end > 3 pm	0.0001	2.5	1.8 - 3.7
Anaesthesia > 1 hr	0.0001	2.2	1.6 - 3.1
Postoperative			
Bleeding	0.0001	266.8	71.7 - 991.9
Pain	0.0001	4.2	3.0 - 5.9
Drowsiness	0.0029	4.1	1.6 - 10.5
Nausea/vomiting	0.0001	4.0	2.8 - 5.8
Dizziness	0.0007	2.7	1.5 - 4.8

Pr, probability; OR, odds ratio; CI, confidence interval.

nausea and vomiting, urological procedures, and anaesthesia duration of more than one hour were predictive. Twersky *et al.*<sup>6</sup> divided unanticipated admission into three groups: avoidable, potentially avoidable, and unavoidable. Women were found to be predictors of avoidable unanticipated admission. In our study, maleness was a predictive factor of unanticipated admission. We had a large gynaecology population, and this was the surgical group with the lowest unanticipated admission rate; this may, in fact, have skewed the numbers of unanticipated admission against men. The difference in predictive factors in our study may be due to differences in patient populations, caseloads, and the prospective nature of the study.

Ear, nose and throat surgery was followed by many admissions for bleeding and for social reasons. This may reflect the reluctance of our ENT surgeons to send their patients home after postoperative observation. Urology was almost twice as likely as orthopaedics, plastic surgery, or neurosurgery to have admissions. Other studies also found urology to have a high unanticipated admission rate.<sup>1,3,6,9</sup> This is attributed to the nature of urological procedures, because bleeding and urinary retention are frequent and unavoidable complications. Longer procedures (> 1 hr) reflecting more complicated procedures were found to be twice as likely to result in admission. Furthermore, when surgery ended after 3 pm, they were 2.5 times more likely to result in unanticipated admission. Freeman *et al.*<sup>11</sup> also found that ophthalmology surgery ending after 2 pm was a predictor of unanticipated admission.

Of the postoperative factors, bleeding was the highest predictor. If bleeding is important enough to be reported as an event, it is almost certain that caution will dictate overnight observation. Pain, drowsiness, and nausea and vomiting had similar predictive values. Because these are frequent postoperative symptoms, it is worthwhile to work toward preventing them or to explore effective treatment. Implementation of clinical pathways to deal aggressively with problems such as pain, nausea and vomiting is necessary in each ambulatory surgical centre. Education of anaesthetists, nurses and surgeons is essential in achieving the goal of reducing the incidence of unanticipated admissions.

With the use of a multimodal approach of opioids, NSAIDs, and local anaesthesia, the incidence of unanticipated admission of patients undergoing ambulatory laparoscopic cholecystectomy was 9.5%.<sup>15</sup> Nine of ten patients can be discharged with considerable savings to the cost of health care. Therefore, there is a possibility that more extensive procedures should be considered for ambulatory surgery. Then a higher incidence of unanticipated admission should be accepted.

Although our overall incidence of unanticipated admission of 1.42% is within the range of other studies, there are areas that can be targeted for improvement. The goal is to ensure that resources are used in an optimal fashion. It is less stressful for all involved if the hospital stay is planned rather than perceived as a complication. Education of ENT surgeons, proper patient selection, and appropriate procedures will reduce the incidence of admission of ENT patients. We can use the high rates for urology to plan to have beds available when those procedures are performed.

Prophylaxis of nausea and vomiting must be considered, at least in high-risk patients. Pain control can certainly be improved. Scheduling should take into consideration the complexity of the surgery, the expected duration of surgery, and the time at the end of surgery. When surgery is scheduled for the later part of the day, it should be for those with the least potential for complications or extended procedures. There also appears to be great latitude regarding escorts and postoperative care. Better education of personnel involved with the postoperative phase is needed. With proper identification of patients at risk, better support can be arranged.

In conclusion, earlier operating times for certain surgical procedures, screening for proper support at home, and implementation of clinical pathways to deal aggressively with problems such as pain, nausea and vomiting should decrease the incidence of unanticipated admission.

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