

## Day surgery admissions and complications

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### Abstract

The growth of British day surgery over the last decade has been a success story. Quality patient care should be the goal for all involved in day surgery and the number of unintended hospital admissions is now recognised as a significant clinical indicator of good day practice. This Cambridge retrospective analysis indicates that, of the 31 117 day cases studied over an 8-year period, 425 admissions were recorded (1.36%). Altogether, 51 major and 386 minor complications caused these admissions. Gynaecological admissions of 203 accounted for 48% of the total. It was noted that the seniority of the surgical and anaesthetic staff was a factor in reducing the incidence of these admissions. There would appear to be a need for universally-accepted day surgical clinical indicators so that day units within different countries may make meaningful comparisons of their admission rates. © 1998 Elsevier Science B.V. All rights reserved.

*Keywords:* Day surgery; Hospital admissions; Complications; Clinical indicators

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### 1. Introduction

During the last decade in the UK there has been a dramatic switch from inpatient to day surgery. This practice has been supported by the independent Audit Commission, the National Health Service (NHS) Management Executive and the Royal Colleges of Surgeons and Anaesthetists of England. [1–4]. New surgical and anaesthetic techniques have allowed the selection of elderly patients for day surgery, many with stable chronic medical conditions. Doubts have been expressed that day patient selection may not be consistently good resulting in an increased post-discharge morbidity with subsequent primary health services involvement. However the implementation of regular quality assurance studies should assure the provision of safe day surgical practices in future [5].

Day surgery is an organisational exercise and many patients may be unsuitable for this form of treatment. Unintended hospital admission from day units has be-

come an important quality indicator when comparing different units and published admission rates have ranged from 0.69 to 5.8% although a suitable standard of practice has yet to be determined due to case mix differences [6].

The aim of the present study was to perform a retrospective analysis of hospital admissions direct from the Addenbrooke's Day Surgery Unit (DSU) for an 8-year period from 1987–1996, excluding 1991/1992 for which precise data was unavailable. The main objectives were to assess the admission rates, the specialities contributing to these rates and the major and minor complications arising.

### 2. Method

This study involved the retrospective analysis of Addenbrooke's Hospital DSU admission records for 1987–1996. The source of the information was 2-fold, firstly from the operating theatre record book and secondly from a specific questionnaire completed by senior nursing staff at the time of patient hospital

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Table 1  
Direct admissions and complications during an 8-year period at Addenbrooke's day surgery unit

	Group A: 1987/1991	Group B: 1992/1996	Total
Operations ( <i>n</i> )	11 952	19 165	31 117
Direct admissions	113	312	425
% Admissions	0.95	1.63	1.36
Complications			
Major	22	29	51
Minor	99	287	386

admission from the day unit. These records contained information concerning the type of surgery and anaesthesia performed, the seniority of medical staff and the causes of both major or minor complications leading to admissions. Data collection for this project was performed by one of the authors (TWO).

The data was analysed to determine the admission rates overall and for each surgical speciality. The latter were compared for two periods, 1987–1991 and 1992–1996, to estimate if changes in surgical and anaesthetic techniques had influenced admission rates. The reasons for admission were also classified according to the nature of the problem into major complications, with the potential for serious harm and minor complications, without the potential for serious harm. These complications were further sub-divided into surgical, anaesthetic and social causes.

Admissions following gynaecological surgery were analysed in more detail to determine which operations were associated with admission, the reason for admission and whether the seniority of medical staff influenced the incidence of admission.

Table 2  
An overview of complications resulting in admission at Addenbrooke's day surgery unit (DSU): 1987–1996

	No. in series	% Total
DSU operations	31 117	
Major complications		
Surgical	50	0.16
Anaesthetic	1	0.003
Minor complications		
Surgical	113	0.36
Anaesthetic	238	0.76
Social	25	0.08
Total	376	1.22

Table 3  
Major complications leading to hospital admissions from the Addenbrooke's DSU: 1987–96

Reason for admission	Major complications <sup>a</sup> ( <i>n</i> )
Perforated uterus	19
Perforated bowel	10
Ectopic pregnancy	10
More extensive surgery	6
Haemorrhage (return to operating theatre)	5
Status asthmaticus	1
Total	51

<sup>a</sup> This represents 0.16% of the 31 117 day operations performed in the series.

### 3. Results

Table 1 records the admissions and complications at Addenbrooke's Day Surgery Unit for 1987–1991 (group A) and 1992–1996 (group B). Of the 31 117 day cases operated upon there were 425 direct hospital admissions (1.36%). The admissions for 1987–1991 were 113 (0.35%) and for 1992–1996, 312 (1.63%). For the two periods studied groups A and B recorded 22 and 29 major complications, respectively. The minor complications increased from 99 to 287 in the series.

Table 2 shows an overview of complications for 1987–1996. The total number of cases studied was 31 117 with major complications arising in 51 instances (0.16%). The minor complications were grouped into anaesthetic causes 238 (0.76%), surgical 113 (0.36%) and social reasons 25 (0.08%).

Table 3 details the 51 major complications leading to admissions. Of these admissions, 68.6% were due to uterine perforations (15 cases), bowel perforation (ten cases) and ectopic pregnancy diagnosis requiring emergency surgery (ten cases).

Table 4 records the minor anaesthetic complications. These amounted to 238 (0.76% of the total of 31 117

Table 4  
Minor anaesthetic complications leading to admission: Addenbrooke's DSU 1987–1996

Anaesthetic complication	<i>n</i>	% Total complications
PONV	68	28.6
Postoperative pain	64	26.9
Delayed recovery	48	20.2
Fainting/vasovagal attack	32	13.4
Reaction to anaesthesia	10	4.2
Others <sup>a</sup>	16	6.7
Total	238	

<sup>a</sup> Others include hyperventilation (3), asthmatic attacks (2), gastric aspiration (2), epilepsy (2), sore throat (2), unstable heart disease (2), hyperthermia (1), laryngospasm (1) and pneumonia (1).

Table 5  
Minor surgical complications resulting in admission from Addenbrooke's DSU: 1987–1996

Surgical complications	<i>n</i>	% Total complications
Haemorrhage	41	36.3
Extensive surgery	36	31.9
Late surgical finishes	14	12.4
Further investigations	12	10.6
Failed operations	5	4.4
Others <sup>a</sup>	5	4.4
Total	113	

<sup>a</sup> Others include blood transfusion required (2), drains in situ (2) and cerebrospinal fluid leak (1).

cases). A total of 68 patients (28.6%) had postoperative nausea and vomiting (PONV), 64 (26.9%) had postoperative pain and 48 (20.2%) had delayed anaesthetic recovery. These three complications accounted for 75.7% of the anaesthetic complications recorded.

Table 5 shows the minor surgical complications leading to hospital admission. These occurred in 113 cases (0.36%). A total of 41 patients (36.3%) haemorrhaged, 36 (31.9%) had undergone more extensive surgery than anticipated and in 14 cases (11.4%) there were late operative finishes.

Table 6 outlines the social complications resulting in admission. Altogether, 25 or 0.08% of the 31117 patients in the series were in this group. In 13 instances patients had no responsible person to care for them at home and on ten occasions had nobody to escort them home.

Table 7 details the reasons for gynaecological admissions. Of the 203 admissions, 46 had major surgical complications and 159 minor complications. The causes of the latter were anaesthetic (40.9%), surgical (28.7%) and social (7.8%).

Table 8 shows the procedures related to the gynaecological day operation admissions for 1987–1996. Two operations figured highly. Vaginal termination of pregnancy and diagnostic laparoscopy recorded 92 and 56 admissions, respectively, accounting for 73.9% of the admissions.

Table 6  
Social complications resulting in admission from Addenbrooke's DSU: 1987–1996

Social complications	<i>n</i>	% Total complications	% Total operations
No carer at home	13	52	0.04
No escort home	10	40	0.03
Psychiatric assess.	1	4	0.003
Late operating start	1	4	0.003
Total	25		

Table 7  
Reasons for gynaecological admissions from the Addenbrooke's DSU; 1987–1996, excluding 1991–1992

	<i>n</i>	% Total complications
Gynae. day operations Admissions	11 857	203
Major complications	46	
Surgical	46	22.44
Minor complications	159	
Anaesthetic	84	40.98
Surgical	59	28.78
Social	16	7.80

Table 9 records the gynaecological day case admission rates related to surgical and anaesthetic staff seniority during 1987–1996. The admission rates expressed as a percentage of the operations performed ranged from 1.05 to 3.27%. Despite performing only 794 general anaesthetics the associate specialist and clinical assistant grades were involved with 26 admissions, an incidence of 3.27%.

Table 10 compares the incidence of unplanned admissions from six studies (1990–1997). These admissions ranged from 0.69 to 5.80%. A grand total of 108300 day cases were investigated and there were 2272 admissions (an incidence of 2.42%).

#### 4. Discussion

This study attests to the safety of day surgery. Careful preoperative selection has been shown to be the key to success in this field. At Addenbrooke's Hospital senior nursing staff routinely perform day case preoperative screening under the supervision of a Day Unit Director (a consultant anaesthetist) The Director's decision regarding the patient's fitness for surgery and anaesthesia is final in border-line cases. Experience has

Table 8  
Addenbrooke's DSU admissions related to gynaecological operative procedures: 1987–1996

Gynae. day operations	Admissions from DSU	% Total gynae. admissions
VTOP <sup>a</sup>	92	46.3
Diagnostic laparoscopy	56	27.6
Lap. Sterilisation	22	10.8
VTOP/ laparoscopy	16	7.9
Others <sup>b</sup>	17	7.4
Total	203	

<sup>a</sup> VTOP: vaginal termination of pregnancy.

<sup>b</sup> Others include D and C, hysteroscopy and excision of vulval skin lesions.

Table 9  
Gynaecological day case admissions from Addenbrooke's DSU related to staff seniority: 1987–1996

	Admissions	Gynae. day operations	Admissions as % operations
Overall results	203	11857	1.71
Surgeon			
Consultant	67	4600	1.46
Senior registrar	87	4884	1.78
Registrar	49	2373	2.06
Anaesthetist			
Consultant	117	6971	1.68
Senior registrar	18	1709	1.05
Registrar	42	2383	1.76
Assoc specialists	26	794	3.27

shown that a preoperative questionnaire is a useful screening tool and that there is no need for a battery of routine investigations prior to day surgery [7]. However, in the present series it was noted that the number of unplanned admissions had increased from 113 (0.35%) in 1987–1991 to 312 (1.62%) in 1992–1996. This may be explained by the fact that more elderly patients with stable chronic medical conditions were presenting for day surgery. The Cambridge unit has no upper age limit and the risk of major morbidity and mortality after day surgery is acknowledged to be no different from a similar aged population not undergoing surgery [8]. Recently in a review of innovations for preoperative assessment and preparation the concept of an anaesthesia preoperative evaluation clinic (APEC) has been reported [9]. The benefits included less cancellations on the day of surgery and decreased surgical and anaesthetic morbidity. The results from the present Addenbrooke's study clearly indicate that such an expensive alternative need not be universally adopted.

Patient safety is the goal in day surgery and the reduction of perioperative sequelae is of the utmost importance. A low incidence of death following ambulatory surgery has been reported [10] but major complications do arise in 1/1455 patients treated [8]. Admissions arising from the 51 major complications in the present series should be viewed seriously and care ought to be taken when new day units are sited. Uterine and bowel perforations are serious complications. Before health authorities plan free-standing day surgery units, the provision of adequate preoperative screening facilities, involvement of senior medical personnel and emergency beds in a nearby hospital should be assured. The message is quite simple. Continual vigilance should be taken when surgery of any extent is performed under general anaesthesia.

The minor complications leading to hospital admission in the present series were similar to previous studies [11–15]. These side-effects may be studied by postoperative outpatient questionnaires although this method may yield a higher incidence of sequelae [16].

Disappointingly the side-effects reported by a 1993 Canadian study, e.g. headache, drowsiness and dizziness are remarkably similar to those recorded in an Aberdeen series 20 years earlier despite the advances in surgery and anaesthesia [17,18]. There is an obvious need to reduce these minor complications and extended research for 1–3 weeks into the postoperative period is now required. However, there may be an irreducible minor complication rate resulting in admissions from day units [11].

In other studies orthopaedic and urological operations have been highlighted as predictors of avoidable admissions [13,14]. Experience in the Cambridge DSU has indicated that gynaecological laparoscopy and vaginal termination of pregnancy produce high complication rates. This is in agreement with a previous study and it would appear that the occurrence of dizziness, drowsiness and postoperative nausea and vomiting (PONV) is dependent on the type of surgery performed and method of anaesthesia [19]. In future, day unit anaesthetists will have to seriously reconsider their anaesthetic techniques for gynaecological day surgery. For instance is the continued use of muscle relaxants, neostigmine, nitrous oxide and endotracheal intubation in the best interests of their day cases? Perhaps more use should be made of total intravenous anaesthetic techniques (TIVA) and the spontaneous breathing of a mixture of oxygen in air via a laryngeal mask airway [20].

Unrelieved postoperative pain and PONV were the commonest reasons for admission in this study. Pain may arise after inguinal herniorrhaphy, circumcision and laparoscopic sterilisation. There is a good case for not performing either bilateral hernia repair and bilateral varicose vein stripping on the same day [11]. Management of pain in the ambulant patient requires 'balanced analgesia' in the form of short-acting opioids, non steroidal anti-inflammatory drugs, simple oral analgesics and long-acting local anaesthetic agents, e.g. bupivacaine [21]. All day units should devise suitable pain assessment and treatment protocols as it is consid-

Table 10  
Unintended hospital admissions from day surgery units: published reports 1990–1997

Year	First author and Ref. No.	Patients (n)	Admissions	% Admissions
1990	Johnson [11]	10 348	72	0.69
1992	Biswas [12]	18 321	225	1.22
1994	Kong [13]	4310	250	5.80
1995	Twersky [14]	32 457	1042	3.20
1996	Verco [15]	11 749	258	2.25
1997	Ogg	31 117	425	1.36
Total		108 380	2272	2.42

ered poor practice to discharge day cases into the community with unrelieved postoperative pain.

PONV is a multifactorial problem and all admission studies published so far have commented on the frequency of this complication but one of the main difficulties has been the lack of uniformity when scoring PONV severity [22]. The authors would agree that prophylactic anti-emetics should be administered to known high-risk day cases and the commonest drugs used to treat PONV in the Cambridge DSU are low-dose droperidol, ephedrine, ondansetron and propofol.

Over the years there has been speculation as to whether the admission rates from day units are influenced by the seniority of the medical personnel involved. In a multicentric study involving 11749 day cases in ten hospitals no firm conclusion was reached as to whether junior anaesthetists had higher admission rates [15]. In the present series a considerable variation in admission rates was recorded, 1.05–3.27%, when the seniority of surgeons and anaesthetists was evaluated. Although these differences were not statistically significant there was a distinct trend towards higher admission rates when junior doctors were involved. If 50% of all elective surgery in the UK is to be performed on a day basis by the year 2000 then surely a large proportion of this clinical work will need to be carried out by senior surgeons and anaesthetists. Indeed junior staff will require supervision as part of their training and already the Royal College of Anaesthetists has issued suitable guidelines [4].

In conclusion this study is in agreement with other international units that day surgery is a safe procedure with benefits for health authorities, patients and hospital staff alike. Complications do arise resulting in expensive hospital admission but with suitable guidelines, preoperative selection and the involvement of senior personnel these problems may be overcome. Hopefully in the future medical and nursing staff will realise the significance of continuous quality assurance studies thereby maintaining high standards. Finally there will be a future need for programmes of education and research if day surgery is to flourish and become global practice.

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