
Brief Review

Preadmission anaesthesia consultation clinic

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Many surgical procedures are delayed or cancelled due to inadequate preoperative assessment and preparation. We describe the case referral pattern and efficiency of our preadmission anaesthesia consultation clinic, which was designed to minimize this problem. Data were collected prospectively on the first 400 patients referred to the clinic. Sixty per cent of referrals were related to the cardiovascular system, in particular coronary artery disease (27%). Eighty-one per cent of referrals were considered appropriate. With ideal functioning of the clinic, delays and cancellations could potentially be reduced to 0.75% and 1.5% of cases respectively. The clinic was well accepted and appreciated by patients. We conclude that this represents a potential important reduction in hospital costs and improvement in operating room efficiency.

Plusieurs interventions chirurgicales sont retardées ou annulées à cause d'une évaluation et d'une préparation préopératoires inadéquates. Nous analysons ici les modalités de la préconsultation et l'efficacité de notre clinique de préadmission laquelle a été conçue pour minimiser les inconvénients des problèmes déjà énoncés. Les données ont été amassées de façon prospective pour les 400 premiers patients référés à la clinique. Soixante pour cent des consultations étaient en rapport avec la système cardio-vasculaire et plus particulièrement la maladie coronaire (27%). Quarante-vingt pour cent furent jugées appropriées. Avec un fonctionnement idéal, les délais et annulations pourraient être réduits à 0,75% et 1,5% respectivement. La clinique est bien

acceptée et même appréciée par les patients. Nous concluons que ce mode de fonctionnement représente une réduction importante des coûts hospitaliers et une amélioration appréciable du degré d'efficacité pour les salles d'opération.

Traditionally, anaesthetists in Canada have had no opportunity to visit their patients before hospital admission. As a result, patients with more complex medical problems are often admitted in advance of their scheduled date of operation to allow thorough preoperative evaluation and preparation, thus creating considerable inconvenience for the patients and additional expense for the health care system. As well, in recent years, there has been a strong shift towards increased use of ambulatory surgery facilities, and a trend towards acceptance of more medically ill patients in these centres. Thus, more patients are presenting for anaesthesia and surgery in these ambulatory facilities without formal preoperative anaesthetic assessment. We believe that these factors have combined to result in an increasingly large number of surgical delays and cancellations and thus represent a considerable impediment to the efficient use of hospital beds and operating room time.

These problems may be resolved if anaesthetists are able to assess higher-risk patients on an ambulatory preadmission basis before surgery. Although initially proposed over 40 yr ago,¹ a review of the medical literature showed that there was very little information on the organization, effectiveness and utilization of the preadmission anaesthesia consultation clinic.²⁻⁵ Therefore, we studied the case referral pattern, operative delay and cancellation rates for patients seen in our newly established preadmission anaesthesia consultation clinic.

Key words

ANAESTHESIA: assessment, outpatient.

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Methods

The preadmission anaesthesia consultation clinic was established at Toronto Western Division, Toronto Hospital in September 1990. This hospital provides tertiary care to patients in general surgery, orthopaedic surgery, urology, ophthalmology, otolaryngology and neurosur-

gery. All staff surgeons received written notification of the existence and function of the new clinic as well as instructions for referring patients to the clinic. They were requested to refer high-risk surgical candidates who might require special preoperative evaluation or preparatory measures. Laboratory investigations were ordered by the surgeon based on his assessment of the patient's problems and the criteria for preadmission laboratory investigations established by the Department of Anaesthesia (Table I). The results of these investigations were available to the anaesthetist at the time of the clinic appointment.

Each patient referred to the clinic was seen by one of the attending staff anaesthetists. Consultations were carried out on weekday afternoons in the anaesthetic clinic consultation rooms located in the Pre-Admission Area. In addition to relevant data concerning the patients' preoperative medical status, the anaesthetist was asked to record whether any additional laboratory investigations, consultations or other preparatory measures were necessary before surgery and whether or not they considered the consultation appropriate. Appropriate consultations were considered to be those in which patients required further preoperative evaluation or preparation. Consultations were also considered appropriate when the consultant anaesthetist obtained or clarified detailed patient information which had an impact on anaesthetic management leading to better preparation or optimal patient care or prevention of possible operative delays or cancellations. A copy of the anaesthetic consultation was then forwarded to the surgeon together with recommendations for any further work-up considered necessary.

Upon completion of the consultant anaesthetist's recommendations, the patient returned for surgery. The time period between the anaesthetic consultation and operative date varied from one to two weeks in order to allow institution of necessary preoperative measures. At the time of surgery, the anaesthetist assigned to the case documented the occurrence and reason for any operative delays or cancellations, and the occurrence of any perioperative complications. No effort was made to match the patients with their consultant anaesthetists. After surgery, patients were questioned by one of the authors (JC) regarding their satisfaction with their earlier clinic visit.

Results

A total of 570 referrals were received in the first full year of operation, during which a total of 17,229 operations were performed. Complete data were collected on the first 400 clinic referrals. The demographic data revealed that the mean patient age was 62.2 ± 16 yr and that 70% of all referrals were women. Seven per cent of patients were graded as ASA I, 63% ASA II, 30% ASA III (Table II).

The majority of referrals were patients undergoing

TABLE I Laboratory requirements of the Department of Anaesthesia (The Toronto Hospital Pre-admission program)

Test	Time frame
CBC - For all patients (except local anaesthesia)	Within 28 d
Sickle cell screen - For all patients of African or Caribbean origin. Should be considered in patients of Middle Eastern or East Indian Origin. If done previously, the result may be documented in the patient's chart. Please note: if the screen test is positive, haemoglobin electrophoresis must be completed.	Any time
PT - For all patients receiving oral anticoagulants.	On admission
Electrolytes, creatinine - For all patients receiving diuretics or suffering from renal disease, diabetes or hypertension.	Within 14 d
Blood sugar - For all diabetic patients.	Within 14 d
Capillary blood glucose - For all diabetic patients.	On admission
Urinalysis* - For all patients	Within 28 d
Pregnancy test (BETA HCG) - To be considered in all women of child bearing age.	Within 24 hr
Group and screen/crossmatch - As appropriate to the surgical procedure using Standardized Orders for Elective Surgical Procedures.	Within 14 d
ECG - For all patients over 45 yr or any patient with a history of heart disease or hypertension.	Within 28 d
Chest x-ray - There is no need for a routine chest x-ray except for those patients over 60 years of age or those with specific indications (smokers or those with lung disease).	Within 3 mo

*Public Hospital Act of Ontario requires haemoglobin concentration and urinalysis on all patients undergoing anaesthesia.

either orthopaedic, ophthalmological, or general surgical procedures, reflecting the distribution of surgical specialties available at our hospital (Figure 1). The primary reason for referral was related to the cardiovascular system in 60% of cases, endocrine system in 13% of cases, respiratory system in 8% of cases, and the neurologic system in 5% of cases (Figure 2). In particular, 27% of referrals were related to coronary artery disease, 19% to

TABLE II Demographic data for patient population referred to the preadmission anaesthesia consultation clinic

n	400
Sex (%)	M:30 F:70
Age (yr)	62.2 ± 16
ASA (%)	I:7 II:63 III:30

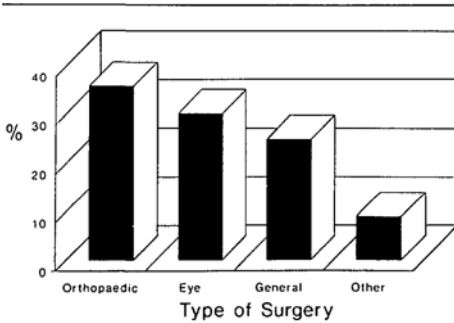


FIGURE 1 The percentage of patients referred from different surgical specialties.

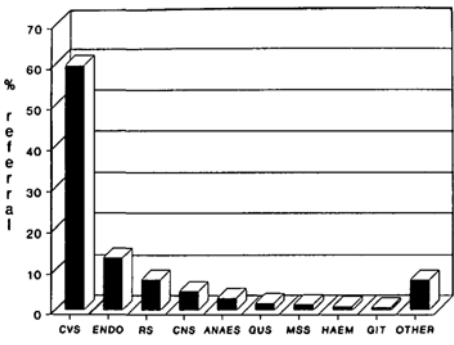


FIGURE 2 The reasons for referral to the outpatient consultation clinic. CVS = cardiovascular, ENDO = endocrine, RS = respiratory, CNS = cerebral nervous system, ANAES = anaesthetic problems, GUS = renal, MSS = musculoskeletal, HAEM = haematological, GIT = gastrointestinal.

hypertension, 8% to diabetes mellitus, and 5% to asthma (Table III).

Overall, 81% of referrals were considered appropriate, and 19% were considered inappropriate. The large proportion of inappropriate referrals was attributed to one surgeon who consistently sent healthy patients for consultations. Thirty-five percent of all patients were sent for

TABLE III Primary reasons for referral to the consultation clinic

	%		%
CVS	60	CAD	27
		Hypertension	19
Endocrine	13	Diabetes	8
		Thyroid disorders	4
RS	8	Asthma	5
Neuro	5		
Others	14		

TABLE IV Breakdown of 247 additional tests ordered for 141 (35%) patients referred to the consultation clinic

	n	%
Haematology	61	15
Biochemistry*	22	6
Blood sugar	21	5
Arterial blood gas	14	4
Pulmonary function test	20	5
Electrocardiogram	32	8
Echocardiogram	26	7
Treadmill stress test	1	0.25
x-ray		
- Chest	29	7
- C-Spine	13	3
- L-Spine	1	0.25
Other	7	2

*Biochemistry includes electrolytes, BUN, creatinine, liver function tests and drug levels.

additional testing, and 9% required further consultation. There was a 5% incidence of operative delays, and a 3% incidence of cancellations. It was recommended that 31% of all patients could undergo treatment as surgical outpatients. In follow up, 35% of our patients had undergone treatment as outpatients.

A total of 141 of 400 patients (35%) required 247 additional tests. Additional testing included haematological, biochemical, and radiological assessments not requested by surgeons, as well as electrocardiography, echocardiography, pulmonary function tests and arterial blood gas analysis (Table IV). Many patients required several of these tests. Thirty-six patients were sent for additional consultations (9%). In keeping with the overall referral pattern, the majority of these were cardiology, endocrine or general medicine consultations (Table V). In addition, the consultant anaesthetists counselled patients regarding pre-anaesthetic NPO guidelines, post-discharge transportation, activities, and supervision, pre-anaesthetic cessation of smoking, and appropriate perioperative continuation of maintenance medications. As well, the

TABLE V Breakdown of 41 additional consultations ordered for 36 (9%) patients referred to the consultation clinic

	n	%
Cardiology	13	3.25
Medicine	11	2.75
Endocrine	10	2.5
Haematology	3	0.75
Respirology	2	0.50
Gastroenterology	1	0.25
Nephrology	1	0.25

TABLE VI Breakdown of reasons for delays and cancellations incurred in consultation clinic patients

<i>Number of cases delayed due to:</i>	
Incomplete lab investigations	16
Tachycardia	1
Hypertension	1
Wait for cryoprecipitate	1
Patient drank	1
	<u>20</u>
<i>Number of cases cancelled due to:</i>	
Thallium scan not done	1
Hypertension	1
Upper respiratory tract infection	1
Anaemia	1
Failed intubation	1
No ICU bed	1
	<u>6</u>

proposed perioperative anaesthetic management and risks were discussed in detail with the patients.

Among the 400 consultation patients, there were 20 operative delays (Table VI). While this seemed a high proportion of cases (5%), a more detailed assessment of the reasons for delays revealed the following: 16 delays were a result of failure to carry out laboratory investigations recommended by the consultant anaesthetist, two were attributable to new findings or unexpected changes in the patients' medical status, and one was related to patient non-compliance with NPO guidelines. Of the 20 delays, we feel that only three would have occurred if the consultation clinic were functioning ideally, thus representing an incidence of 0.75% operative delays. In each case of operative delay, the problem was corrected and all patients underwent uneventful anaesthesia and surgery on the same day.

Seven cancellations were recorded (1.8%) (Table VI). One was a result of necessary testing (Thallium scan) not having been performed. Four resulted from further deterioration in the patients' medical condition which precluded surgery. One case was cancelled due to failure to intubate the trachea, and one cancellation was due to an ICU bed

TABLE VII Breakdown of reasons for 66 cancellations incurred in 16,659 patients not seen in the consultation clinic

Cardiovascular	25
Respiratory	12
Haematological	7
Endocrine	6
Gastrointestinal	3
Renal	2
Miscellaneous	11
Total	<u>66</u>

TABLE VIII Evaluation of patient satisfaction with consultation clinic experience

	Yes	No
Improved care (%)	92	8
Better informed (%)	92	8
Less anxious (%)	84	16

not being available. In this group, we estimate that six of the original seven cancellations would have occurred despite ideal functioning of the consultation clinic. Thus 1.5% would seem to represent a true incidence of operative cancellations.

In no case was there a delay or cancellation because of disagreement between the consultant anaesthetist and the anaesthetist providing perioperative care. During the first year of the preadmission anaesthetic consultation clinic's existence, 570 patients were referred by the surgeons. During that period, 16,659 patients were anaesthetized without referral to the consultation clinic. The majority of these patients were admitted one day before surgery for preoperative assessment and preparation. These patients were evaluated by their anaesthetist the evening before surgery. In this group of patients not referred to the anaesthesia consultation clinic, there were sixty-six cancellations (Table VII).

When interviewed before discharge from hospital, 92% of patients felt that their anaesthetic consultation had contributed to better peri-operative care. Ninety-two per cent felt that they were better informed and 84% felt less anxious as a result of the preoperative consultation clinic visit (Table VIII).

Twenty-eight patients had anaesthetic complications (7%) and two patients had surgical complications (0.5%) (Table IX).

Discussion

In our institution, 40% of all surgery is conducted on an outpatient basis. By 1995, it is predicted that this figure will increase to more than 60%.⁶ Thus a large proportion of patients will present for surgery without formal preoper-

TABLE IX Breakdown of 30 surgical and anaesthetic complications

<i>Peri-operative anaesthetic complications (7%)</i>	
Hypertension	8
Arrhythmia	6
Hypotension	5
Post-op respiratory arrest	1
Laryngospasm	1
Difficult intubation	1
Inadequate spinal block	3
Allergic reaction	1
Post-op confusion	1
Post-op hypoglycaemia	1
Total	28
<i>Surgical complications (0.5%)</i>	
Increased IOP	1
Blood loss > 2500 ml	1
Total	2
Total number of consulted patients who underwent surgery	393

ative anaesthetic assessment. Furthermore, the acceptance of older and more medically compromised patients, as well as more extensive operations in ambulatory facilities may lead to an increased rate of operative delays and cancellations.^{7,8} Ross and Watson reported a 14% cancellation rate among patients presenting for elective joint replacement surgery.⁹ Clearly, the cost-effective use of both outpatient and inpatient surgical facilities necessitates efficient use of operating room time and personnel. Repeated delays and cancellations result not only in increased costs for hospitals and diminished revenue for physicians but also in frustration and anxiety for patients who have prepared themselves psychologically for surgery.

In addressing the issue of preventable surgical delays and cancellations in the face of rising hospital costs and shrinking budgets, we established a preadmission anaesthesia consultation clinic. Our aims were to:

- 1 Improve patient care and minimize operative delays and cancellations through more thorough preoperative evaluation and preparation of medically compromised patients, thus improving efficiency.
- 2 Improve patient satisfaction and comfort by providing maximal information to the patients in a relaxed setting.
- 3 Optimize communication between anaesthetist and surgeon regarding individual patient care.

Establishment of a preoperative evaluation centre for all outpatients by Burk *et al.* allowed a reduction in first case delays from 17 in a six-month period to only one in a full calendar year.²

An anaesthesia consultation service has been described for obstetric populations. Hew-Wing *et al.* at Mount Sinai Hospital in Toronto have provided such a service since 1982, and believe that it provides a worthwhile method of

assessing women with a variety of pregnancy-related concerns.³

Preadmission anaesthetic assessment has also been demonstrated to reduce paediatric day surgery cancellations. A reduction in cancellations of greater than 8% was achieved simply by contacting patients' families by telephone one week in advance of the proposed surgery.¹⁰ Paediatric preoperative assessment clinics have also proven effective. In one instance it was shown that such patients had a five times lower risk of cancellation than those not seen at the preoperative clinic.¹¹

Our clinic received a wide variety of referrals. The majority were related to cardiovascular disease. However, virtually all organ systems were represented. Many referrals related to previous difficulty with anaesthesia or to problems such as atypical pseudocholinesterase or susceptibility to malignant hyperthermia.

When notified of the existence of the clinic, surgeons were asked to identify and refer appropriate patients. We defined appropriate patients as those in whom the surgeon identified medical or surgical problems which necessitated special preoperative anaesthetic consultation. Surgeons were advised that the clinic was not intended as a mechanism for routine preoperative assessments, nor was it intended as a primary care service.

Eighty-one percent of referrals were considered appropriate. Of the remaining 19% of consultations deemed inappropriate, many were received in the initial period after establishment of the clinic and their occurrence decreased as surgeons became more familiar with the aims and functions of the clinic. The large proportion of inappropriate referrals was attributed to one surgeon who consistently sent healthy patients for consultation. This emphasizes the need for further education of surgeons so that proper referrals to the clinic can be ensured. While we did not identify specific conditions which merit preoperative consultation, lists such as that recently published by Pasternak¹² may serve as a useful guide in this regard, and could be distributed to all participating surgeons (Table X).

Overall, less than half of the patients seen in consultation required further testing or consultation. Nonetheless, 81% of all consultations were deemed appropriate. Although this may appear to be a discrepancy, we agree with others that better-informed patients and anaesthetists contribute to safety and a better outcome. Eagle and Davies indicated that better assessment of risk may not only limit potential medicolegal problems but may also allow for provision of better medical care.¹³ Thus, we do not feel that additional laboratory or other consultative evaluation is required to make an anaesthetic consultation appropriate or useful.

In the immediate preoperative period, we had delays in

TABLE X Conditions for which preanaesthesia evaluation is recommended prior to the day of surgery

Cardiovascular
History of angina
History of myocardial infarction
Previous cardiac surgery
Arrhythmias (atrial and/or ventricular)
Hypertension (diastolic >90 mmHg, systolic >150 mmHg)
History of congestive heart failure
Sickle cell disease or other haemoglobinopathy, coagulopathy
Respiratory
Asthma (steroid-dependent and/or acute episode within past month)
Severe chronic obstructive pulmonary disease
Previous major airway surgery
Other serious respiratory disease or history
Upper and/or lower airway tumour or obstruction
Endocrine
Non-diet-controlled diabetes (insulin or oral hypoglycaemic agents)
Adrenal disorders, active thyroid disease
Neuromuscular
History of seizure disorder
History of serious CNS disease
History of myopathy or other muscle disorders
Hepatic
Any active hepatobiliary disease or compromise
Ascites
Musculoskeletal
Kyphosis
Scoliosis
Temporomandibular joint disorder
History of cervical spine injury or surgery
Oncological
Patient receiving chemotherapy
History of CNS tumour
Other oncology with important physiological residua
Gastrointestinal
Massive obesity (>140% ideal body weight)
Hiatal hernia
Symptomatic gastroesophageal reflux
Diverticulitis
Crohn's disease
Inflammatory bowel disease

With permission from Pasternak RL.¹²

5% and cancellations in 1.8% of the patients seen in the consultation clinic. Many of these delays and cancellations were due to inadequacies in the organization and carrying out of necessary laboratory testing. While this was partly a result of the relatively recent introduction of the clinic, a certain incidence of delays and cancellations would seem to be inevitable. With improved efficiency in booking tests and obtaining test results before scheduled surgical dates,

we feel that there is the potential to reduce operative delays and cancellations in elective high-risk patients to as low as 0.75% and 1.5% respectively.

Cohen *et al.* suggested that as many as 50% of patients require further investigation and assessment before elective surgery.¹⁴ Thus, a cancellation rate of 1.8% in our elective high-risk patients suggests the potential for a large reduction in time wasted, costs incurred, and inconvenience.

In 1988/89, the Ontario Ministry of Health statistics showed that, in our institution, the average total cost for caring for a patient on the ward was \$600.00 per day.* Currently the total cost for a patient occupying an ICU bed is \$1600.00 per day. Thus, preadmission anaesthetic consultations may not only improve operating room efficiency but may also reduce the duration of hospital stay and further reduce hospital costs. The potential for even further cost reduction can be illustrated by considering that during the one-year period under study, 66 patients who were not referred to the outpatient consultation clinic had their elective surgery cancelled due to suboptimal medical condition. If these patients had been evaluated and prepared for their surgery through the preadmission consultation clinic, there may have been fewer cancellations in this group.

A further benefit arising from preadmission anaesthesia consultations may be seen in their application to "Same Day Admit" programs in which patients are admitted to hospital on the day of surgery and remain as inpatients postoperatively. The efficiency of these programmes in eliminating unnecessary preoperative hospitalizations and minimizing lengths of stay would be optimized by the availability of a preadmission anaesthesia consultation service.

A preoperative visit by an anaesthetist can reduce the degree of anxiety felt by patients regarding their anaesthesia and surgery.¹⁵ In addition, patients are interested in receiving explanations about anaesthesia and information about potential complications. In one study, 55% of patients seen previously in a routine preoperative visit indicated that they would have preferred more such information.¹⁶ One of our aims in establishing our clinic was to enhance patient comfort and satisfaction with their anaesthetic experience. We believe we could help to achieve this goal by seeing high-risk patients in a quiet and relaxed atmosphere. In this way, more detailed information could be presented in an easily understood manner and in a location away from the threatening environment of a large hospital ward or operating theatre.¹⁶ We believe that

*Information available from: Ontario Government Book Store, 880 Bay Street, Toronto, Ontario, M5S 1Z8 and requesting document entitled "Hospital Statistics 1988/89."

we were successful in allaying many patients' fears and that the high degree of patient satisfaction found in follow-up interviews was a direct reflection of improved patient-anaesthetist rapport. These findings are consistent with those of Murchison who found an 87% satisfaction rate with outpatient consultation services.⁴

Conclusion

The Preadmission Anaesthesia Consultation Clinic represents a new and effective means of evaluating higher risk, elective surgical patients. The majority of operative delays in clinic patients resulted from inadequacies in organizing preadmission laboratory tests and a failure on the part of the surgeons to wait for the completion of tests before scheduling surgery. This system has the potential to reduce operative delays and cancellations and to significantly reduce hospital costs by making more efficient use of available facilities and personnel in a manner which is well accepted and appreciated by patients.

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