

# Improving surgical service utilization An application of program budgeting and marginal analysis

Shannon Spenceley, Lisa Halma\*

*Chinook Health Region, Lethbridge Regional Hospital, Room 4K-110, Auxiliary Wing, Lethbridge AB, Canada T1J 1W5*

Received 9 July 2002; accepted 24 July 2002

---

## Abstract

The economic framework, 'Program Budget Marginal Analysis' (PBMA) has been used by health care managers internationally to help set priorities and allocate resources within and across programs of care. The authors describe the use of the PBMA framework to guide a pilot project aimed at improving surgical services utilization in a regional hospital in a Western Canadian health region. The focus of the pilot project was the shifting of four selected inpatient procedures to an ambulatory approach while maintaining or improving standards of patient care.

© 2002 Elsevier Science B.V. All rights reserved.

**Keywords:** Outpatient surgery; Ambulatory surgery; Resource allocation; Surgical services utilization

---

## 1. Introduction

Accountability is a buzzword in all facets of the public sector. As competition intensifies for dwindling resources, the need increases for sound decision-making about resource allocation and priority setting. This is especially true in the health sector where staff is repeatedly being asked to 'do more with less'. Insufficient resources constitute a major issue facing surgeons in Alberta [1]. One method that has been used by health authorities internationally in order to free up more surgical resources is to shift procedures from an inpatient to an outpatient (day surgery)<sup>1</sup> setting [2,3]. In the United States the volume of outpatient surgeries performed increased by over 300% from 1979 to 1989, and it continues to rise [4–6]. Increases in the number of outpatient surgical procedures performed have also been reported for larger surgical centers in Canada [7] and the province of Alberta. The Alberta Ministry of Health

reports that in 1993–94, 69.3% of all surgeries done in Alberta were day surgeries; in 1995–1996, this percentage had increased to 74.3% [8].

The focus of this paper is a pilot project undertaken in a 277 bed acute care hospital in the Chinook Health Region (CHR) in Southern Alberta. This project consisted of a thorough examination of the volume and nature of selected outpatient surgeries, in an attempt to streamline surgical bed utilization and better meet the growing need for surgical services in the region. In 1999–2000, approximately 11,000 surgical procedures were performed in this hospital, with just over 50% of all surgeries performed on an outpatient basis. One explanation that has been asserted for this lower local figure is the substantially higher percentage of seniors residing in the CHR when compared to other Alberta Health Authorities,<sup>2</sup> the thinking being that an ambulatory approach is less often appropriate with elderly surgical patients. Even when this was taken into account, however, it was discovered that opportunities

---

\* Corresponding author. Tel.: +1-403-382-6631.

E-mail address: [lhalma@mail.chr.ab.ca](mailto:lhalma@mail.chr.ab.ca) (L. Halma).

<sup>1</sup> Note for the purposes of this document the terms day surgery and outpatient surgery will be synonymous and indicative of a surgical procedure where the patient is operated on and discharged home in less than 24 h.

---

<sup>2</sup> Based on data taken from Calgary and Capital Health Region Annual Reports (1999/2000) and the Chinook Health Region's Continuing Care 10-Year Plan (2000).

existed for expanding the ambulatory option in providing surgical services.

The Director of Acute Care was interested in using a 'Program Budgeting and Marginal Analysis' (PBMA) framework to further examine the possibilities. The defining goals of the resulting project were:

- to increase the volume of outpatient surgeries while maintaining or improving standards of patient care, and
- to improve surgical service utilization in order to allow more surgical needs to be met.

This paper describes the process undertaken by the Surgical Program team in order to meet these goals.

## 2. The ambulatory surgery PBMA project

PBMA is a decision making framework that has been used by managers in the UK, Australia and New Zealand to help set priorities and allocate resources within and across programs of care [9].

The program budget consists of relevant costing and/or activity data about the program or topic under investigation. Simply put, the program budget addresses the question, 'how can we know where we are going if we do not know where we are?' by providing decision-makers with a picture of current resource spending and allocation patterns [9]. The marginal analysis component of this framework examines whether or not services provided should be changed [9]. The primary focus of marginal analysis is to maximize the marginal net health gain(s) through changes in the way resources are allocated and services are delivered.<sup>3</sup> In summary, PBMA involves assessing the costs and benefits of proposed changes in the delivery of health care, in order to increase overall benefit within existing budgetary constraints. The guiding PBMA framework and the subsequent processes undertaken by the Surgical Program team are detailed in Fig. 1.

One of the first steps in applying the framework involved the establishment of a core project team. This team consisted of:

- CHR Health Care Analyst (a masters prepared registered nurse),
- University of Calgary Health Care Economists (2),
- CHR Research Associate (a masters prepared researcher),

- CHR Case Costing Coordinator.

The health care analyst provided the clinical expertise needed to assess, review and synthesize the literature and additional information related to the provision of ambulatory surgical services. The economists, recognized experts in the use of the PBMA model, assisted the Surgical Program participants with application of the framework. The Case Costing Coordinator supplied surgical costing and activity data, and the research associate calculated the potential resource impacts of implementing the evidence-based recommendations, and kept participants 'on track' in terms of using processes consistent with the PBMA framework.

The core team made an initial presentation of the PBMA framework to the Directors of Acute Care and of the Medical/Surgical program, the Chief of Surgery, the Nursing Unit Managers for the Day Surgery Unit (DSU), Post Anaesthetic Recovery Room (PARR) and Surgical Suite, as well as several surgeons. At this meeting, the framework was introduced and a surgical services case study was presented [10]. A program budget based upon the average inpatient and outpatient costs of different surgical procedures was also reviewed, and the group discussed how the framework could be applied within the current setting to identify surgical procedures for shifting from an inpatient to outpatient setting. Discussion culminated in the approval to proceed with the PBMA Pilot Ambulatory Surgical Project. Further, consideration of a number of factors including PBMA principles, literature support [11–13,4] and physician preference resulted in the selection of four high volume procedures (laparoscopic cholecystectomy, inguinal hernia repair, reduction mammoplasty, and rotator cuff repair) for the pilot. It was also established at this initial meeting that representatives of this larger group would actively participate as an 'expert advisory panel', in order to guide the core team in its work.

In order to build a solid foundation for the project and any resulting recommendations, it was decided that four major processes would be embarked upon by core team members:

- extensive literature review,
- pursuit of practical expertise from individuals in organizations providing ambulatory surgical services,
- internal policy review,
- surgical patient chart audit.

Within each process, major components of ambulatory surgical service provision defined the parameters of the inquiry. These components included patient selection for an ambulatory approach; patient education and preparation; pain/nausea management; discharge criteria and patient follow up.

<sup>3</sup> It is important to remember that whenever resources are allocated to one option, some benefit will be lost because resources were not allocated to an other option(s); these lost benefits are called opportunity costs.

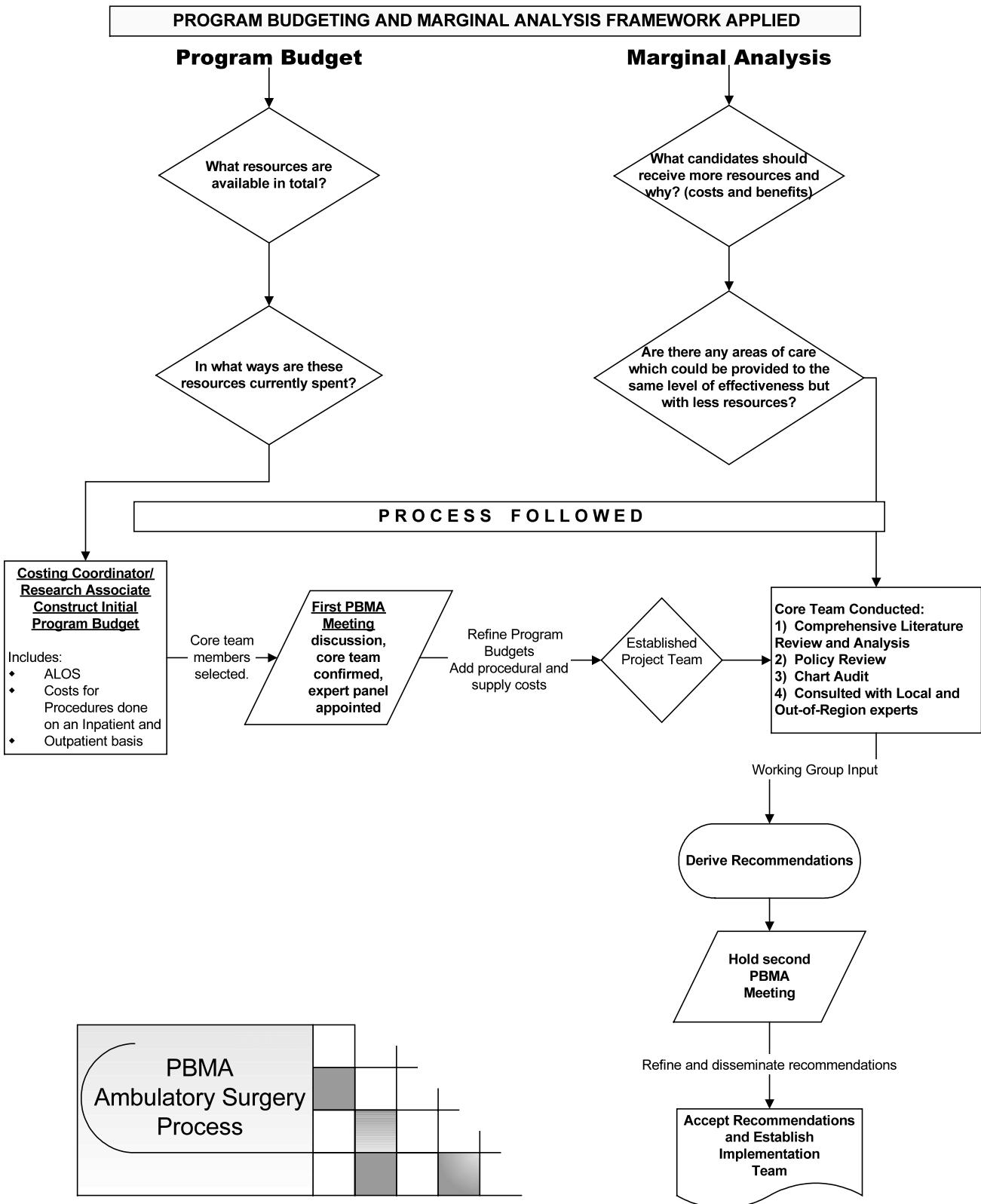


Fig. 1. The PBMA framework as applied to the ambulatory surgery project.

### **3. Literature review**

The review was limited to articles published no earlier than 1995, with rare exceptions for older but seminal articles published in the area. The review focused on, but was not limited to, research articles in peer-reviewed medical, nursing or allied health journals. Databases searched included MEDLINE, HEALTHSTAR, the Cochrane Database and the Cumulative Index of Nursing and Allied Health Literature (CINAHL). Approximately, 200 articles were chosen for review by the health care analyst, and were rated by the analyst and research associate according to Sackett's [14] criteria for evaluating published evidence. Of the 200, 178 were found to be useful and were included in the analysis. In order to accommodate wider review of the analyzed evidence, an annotated bibliography of reviewed articles was developed, and then shared with the expert advisory panel.

### **4. Practical expertise**

Expert panel members suggested other surgical facilities in Alberta for contact by the health care analyst. Specific questions regarding the components of ambulatory surgical service were asked of managers directly responsible for ambulatory surgery units in these facilities. Additional contacts were sought in other Canadian health care organizations based upon the recommendations of the managers interviewed. In total, seven separate surgical facilities were contacted, and valuable operational information was gained. In order to place the information in local context, interviews were also conducted by the health care analyst during the same period of time with local surgical nurse managers.

### **5. Policy review**

Policies were reviewed by the analyst with an eye to their support of each phase of the ambulatory surgical process. Due to a number of organizational shifts in management structure in the previous 2 years, it was found that many policies were present only in draft form. Those that did exist in final form required updating. As such, the current project offered a timely opportunity for policy revision based upon the most current research evidence.

<sup>4</sup> The confidence interval was calculated using the Survey System confidence interval calculator available at <http://www.surveysystem.com/sscalc.htm#factors>.

### **6. Surgical patient chart audit**

A review of randomly selected hospital charts for each of the four identified procedures (where the procedure of interest was the only procedure completed) was undertaken by the project analyst and research associate using an audit tool that focused the review on each phase of the surgical process. A 10% sample of all procedures of each identified type performed in fiscal year 2000–2001 at the regional hospital was calculated as providing a statistical confidence level of  $\pm 14\%$ .<sup>4</sup> This only improved to  $\pm 10\%$  with a doubling of sample size to 20%. The 10% sample, therefore, was deemed adequate by the core team to satisfy the goal of the audit: an overview of current practice patterns.

### **7. Developing and communicating resulting recommendations**

The review of literature and communication with external experts was extremely important in establishing a baseline of 'best practices'. The provision of the annotated literature analysis was extremely useful in establishing confidence in the resulting recommendations, and in enhancing the credibility of the process in the eyes of the medical practitioners on the expert panel. The evidence was well-received, but as one member stated 'there were no big surprises' forthcoming in the information. There was also an expressed perception that local patients were 'different' from those populations reported in the literature, and may be less appropriate choices as ambulatory surgery candidates. The review of current practice patterns from actual patient charts was extremely revealing and somewhat surprising to the group. It was discovered that there were a number of improvements that could be made in each phase of the surgical process. It also became apparent that many patients having one of the selected procedures as inpatients were, in fact, good candidates for an ambulatory approach to their surgery. Space does not permit a detailed listing of all the project recommendations. A brief description of the general recommendations for changes in surgical services offered at this regional hospital is as follows:

- 1) It appeared feasible to provide an ambulatory option to approximately 40–50% of laparoscopic cholecystectomy patients, 45–55% of inguinal hernia repair patients, 65–75% of patients having reduction mammoplasty and 45–55% of patients undergoing rotator cuff repair.
- 2) A need was identified for the DSU nursing staff and possibly an anesthetist to have some form of contact with DSU patients prior to the day of surgery.

- 3) A need was identified for standardized preoperative patient education material, developed specifically for DSU patients.
- 4) There appeared to be potential for improving the prevention and treatment of postoperative nausea and vomiting (PONV), utilizing risk stratification criteria. Issues suggested for closer examination included: the current heavy reliance on opioid analgesia, as well as the low incidence of intraoperative PONV prophylaxis.
- 5) There existed a potential to improve pain control, and it was recommended that the use of local anesthetic infiltration as well as the increased use of non-steroidal anti-inflammatory drugs (NSAIDS) be explored further.
- 6) There was potential to refine PARR discharge and home readiness criteria, utilizing evidence based tools.
- 7) There was a need identified to develop a post-operative follow up process for DSU patients.
- 8) Substantial policy gaps existed, and would require focused attention as changes were implemented.

Detailed review of a comprehensive project document outlining each phase of the ambulatory surgical service process and the attendant recommendations [15] comprised most of the second meeting with decision-makers from the Surgical Program. Subsequent meetings were then held with other stakeholder surgeon groups. The purpose of these meetings was to examine and discuss the recommendations put forth in the Ambulatory Surgery document in light of local experience and to decide how to proceed. After these initial meetings, a working group was established consisting of the Directors of Medical/Surgical Program and Transitional Care (responsible for the preoperative assessment clinic), Surgical Program nurse managers from all impacted areas, the Surgical Program nursing educator, representatives from Health Records, Booking and Information Systems, and two core team members (the research associate and health analyst). The mandate of this group was to implement the changes in practice that were now supported in principle by the Surgical Program team.

## 8. Discussion

At the time of writing, several changes have been implemented and evaluation is currently underway. Implemented changes for patients having one of the four selected procedures are outlined in Table 1.

Discussion of an evaluation plan began with the first meeting of the project implementation working group. It was decided that evaluation processes would examine:

- 1) Patient satisfaction. The modified Perceptions of Quality of Hospital Care [17] patient satisfaction instrument would be used to capture satisfaction levels pre- and post-transition to the new care processes. It was also intended that satisfaction levels would be compared for patients having specific procedures as inpatients or day cases.
- 2) Incidence of events such as unanticipated admissions for booked day surgery patients within the first 24 h, as well as visits to the emergency room (ER) would be monitored.
- 3) Postoperative symptom management. Focused analysis of information obtained on telephone follow up by an assigned DSU staff nurse within 24 h of surgery would take place. The focus of the initial analysis would be the management of pain, and PONV.
- 4) Surgical process analysis. It was decided that a focused chart audit on patient care management and flow through the system as related to overall outcomes would be useful.
- 5) Staff/physician satisfaction with transition. A focus group approach to this component of evaluation was supported.

Formal evaluation of the project has not been completed, so it is not yet possible to report results. The shifting of the four identified procedures will continue to be treated as a pilot project, and further expansion of ambulatory services based upon this work will not occur until thorough evaluation of the pilot has taken place.

It is not premature, however, to offer the following reflections on what the PBMA process brought to this endeavor. Two simultaneous and iterative processes were taking place throughout this project. An extensive review of published evidence and of local and external expertise was carried out, and provided the desired direction for forward movement. As progress was made towards the application of the collected evidence to the local context, the use of the PBMA framework helped the team to construct a realistic map of alternative routes to desired outcomes. The PBMA framework is built upon the assumptions that resources are constrained and that decisions about program funding always involve tradeoffs. Consideration of these trade-offs or ‘opportunity costs’ allows decision-makers to take into account not only what may be gained, but perhaps more importantly, what will be lost by funding option A at the expense of option B. Within this health region, tools existed to facilitate the exploration of the costs associated with the proposed shifts to an ambulatory mode of service. A costing database that interfaced with our Regional information system (Meditech) made it possible to develop a program budget for classifying resource expenditure by surgical procedure, surgical setting and surgeon. These mechanisms enabled the

**Table 1**  
Implemented changes to date

Phase				Comments/challenges	
Preop	Physicians assess candidacy for day surgery on list of agreed-upon, evidence-based, consistent criteria	Patients receive standard education/package	Patients complete self-administered history form in physician office, sent in with booking form Concise, consistent physical examination form developed with physician input; to be sent in with booking	Patient contact established with PAC Patients assessed against PONV risk stratification criteria	Extensive education with physicians and their office staff required, and should be repeated as consistency tends to decrease if this is not done Extensive physician input and collaboration critical in development of physician documentation instruments
Intraop	Increased use of local anesthesia	Anesthetists report referral to and use of PONV risk criteria			Difficult to specifically monitor actual intraoperative changes in physician practice
Postop	Standardized minimum discharge criteria implemented  Stage 1 (PARR) and 2 (home)	DSU documentation tools streamlined	Standardized discharge plan developed; individualized as necessary	Potential problem areas identified and noted on-line at discharge, for follow up by phone call next day	Online documentation is not yet a reality in our region, and was new to all staff involved  Extensive educator support was key to success, and RN's now very supportive of online documentation
Follow up	Phone call within 24 h, standardized assessment tool developed	Follow up call documented on-line using Meditech		On-line documentation should allow for timely reporting of collected evidence—problem areas can be addressed sooner	

core team to obtain and provide decision-makers with detailed information on the number of cases, the average length of stay (ALOS), procedural costs and total case costs associated with the identified procedures. This data proved invaluable when it came to projecting the number of cases that could be potentially shifted to an ambulatory mode of service, and the resulting number of bed days that could be saved. It provided a starting point from which costs and benefits could be calculated or determined for individual recommendations. A strength of the PBMA framework is that it provides decision-makers with the opportunity to 'evaluate the benefits of a health service with the actual or estimated costs' [16]. For example, a recommendation went forward to refer all day surgery patients to the Pre-operative Assessment Clinic (PAC) as the published evidence indicated that patient education and the timely completion of preoperative diagnostics resulted in improved patient outcomes, reduction in ER visits and in surgical cancellations. As such recommendations surfaced and were 'percolated' through the PBMA process, decision-makers were provided with projections about the resource, staffing and space implications associated with such changes. Managers were then able to systematically weigh projected benefits against these projected costs.

Also integral to the PBMA process is a review of the historical provision of services. An understanding of existing structures and processes was developed through interviews with care providers and ancillary staff. This information was transformed into a process flow map that captured the entire surgical process from the perspective of the patient. Group review and discussion highlighted areas for improvement. For example, it was discovered that Booking and DSU processes were often delayed by the late submission of a completed patient history from the referring surgeon. In order to address this obstacle to efficient service, it was recommended that patients complete a portion of the history form independently, leaving a brief and concise standardized section for physician completion. The completed form would then be submitted by the surgeon with the surgical booking form. This two-part (but one page) form was constructed with extensive feedback from physicians, patient educators and internal health records experts, and is currently being piloted quite successfully.

PBMA processes support the generation and discussion of creative options to implement the desired program changes. The dynamics of the expert panel on this project necessitated starting with concrete examples, in order to stimulate discussion and encourage progress. Consequently, during the second PBMA meeting, panel members were presented with two potential options that would allow for wide scale implementation of the project recommendations viz. development of an ambulatory surgery clinical pathway, and/or the establish-

ment of an ambulatory surgery preoperative clinic. For each option, expected benefits and costs were outlined in order to illustrate how the many individual recommendations might be actualized in our environment. These options served as useful starting points for discussion. Ultimately, the panel opted to combine elements from each of these options and implement the recommended changes incrementally.

It was the observation of core team members that the PBMA approach had a positive impact on the decision making processes of the Surgical Program team in this project. Use of PBMA principles required focused interaction, discussion and creativity as options were generated and costs were realistically compared. The framework was useful as the team focused upon increasing the volume of ambulatory surgery performed while maintaining or improving standards of patient care within existing budgetary constraints. PBMA provided an explicit framework for directors, nursing unit managers, clinicians and surgeons to consider specific practice and process changes which would allow the achievement of these goals with four selected procedures. It seems likely that the PBMA process will be of continued value as a decision making framework should further expansion be supported by the evaluation of this pilot project.

## Acknowledgements

The authors gratefully acknowledge the contributions of Dr Cam Donaldson, Dr Craig Mitton and the entire Chinook Health Region Surgical Program team.

## References

- [1] Armstrong DR CP. reporting for General Surgery [online]: <http://www.amda.ab.ca/general/communications/publications/rpts-to-rf/spring99/reports-sections.html>.
- [2] Linden I, Engberg IB. Nursing discharge assessment of the patient post-inguinal herniorraphy in the ambulatory surgery setting. *Journal of Post Anesthesia Nursing* 1994;9(1):14–9 (February).
- [3] Miller DR. Anaesthesia drug costs and utilization: time for a critical re-appraisal. *Canadian Journal of Anaesthesia* 1996;43(1):4–8.
- [4] Short KK, Ringler SL, Bengtson BP, Hunstad JP, Henry E. Reduction mammoplasty: a safe and effective outpatient procedure. *Aesthetic Plastic Surgery* 1996;20(6):513–8 (November–December).
- [5] Quan KP, Wieland JB. Medicolegal considerations for anesthesia in the ambulatory setting. *International Anesthesiology Clinics* 1994;32(3):145–69.
- [6] Hecht AD. Creating greater efficiency in ambulatory surgery. *Journal of Clinical Anesthesia* 1995;7:581–4.
- [7] Fowlie P, Francis H, Russell S. A perioperative communication with families. *Canadian Nurse* 2000;96(8):30–7.
- [8] Alberta Health. Alberta Ministry of Health Annual Report, 1997.

- [9] Mitton C, Donaldson C. Setting priorities in Canadian regional health authorities: a survey of key decision makers. *Health Policy* 2002;60(1):39–58.
- [10] Scott S, Scott A, Donaldson C. Implementing the results of marginal analysis: a case study in general surgery services, 1997 (Unpublished document).
- [11] Davies BW, Lewis RD, Pennington GA. Reduction mammoplasty: a comparison of outpatient and inpatient procedures. *Aesthetic Plastic Surgery* 1996;20(1):77–80 (Winter).
- [12] Mitchell JB, Harrow B. Costs and outcomes of inpatient versus outpatient hernia repair. *Health Policy* 1994;28(2):143–52 (May).
- [13] Cordasco FA, McGinley B, Charlton T. Rotator cuff repair as an outpatient procedure. *Journal of Shoulder and Elbow Surgery* 2000;9(1):27–30 (January–February).
- [14] Sackett DL. How are we to determine whether dietary interventions do more good than harm to hypertensive patients? *Canadian Journal of Physiology and Pharmacology* 1986;64(6):781–3 (June).
- [15] Spenceley S, Halma L. Ambulatory surgery PBMA project: inpatient to outpatient shifting of four identified procedures, 2000 (Unpublished document).
- [16] Edwards D, Peacock S, Carter R. Setting priorities in South Australia community health III: regional applications of program budgeting and marginal analysis. Melbourne (Aust): Centre for Health Program Evaluation, Monash University and the University of Melbourne, 1998.
- [17] Blegen MA, Reiter RC, Goode CJ, Murphy RR. Outcomes of hospital based managed care: a multivariate analysis of cost and quality. *Journal of Obstetrics and Gynecology* 1995;86(5):809–14.