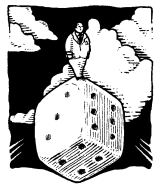
Clinical basics

Prostate cancer: 12. The economic burden



Education

Éducation

Steven A. Grover,*†‡§ MD, MPA; Hanna Zowall,*† MA; Louis Coupal,*† MSc; Murray D. Krahn,¶ MD, MSc

***Centre for the Analysis of Cost-Effective Care, †Division of Clinical Epidemiology, and ‡Division of General Internal Medicine, Montreal General Hospital, Montreal, Que.; §Departments of Medicine and of Epidemiology and Biostatistics, McGill University, Montreal, Que.; ¶Departments of Medicine and Clinical Biochemistry, University of Toronto, Toronto, Ont.**

This article has been peer reviewed.

The members of the Prostate Cancer Alliance of Canada, an umbrella group formed to carry out the recommendations of the 1997 National Prostate Cancer Forum, are pleased to support the intent to inform both health care professionals and lay people about the detection, diagnosis and treatment of prostate cancer through this 13-part series. The list of members of the Alliance appears at the end of this article.

Series editors: *Dr. Neill A. Iscoe, Medical Oncologist, Toronto–Sunnybrook Regional Cancer Centre, and Dr. Michael Jewett, Professor and Chairman, Division of Urology, University of Toronto, Toronto, Ont.*

CMAJ 1999;160:685-90

The economic burden of prostate cancer is substantial and growing. The diagnosis of new cases has been increasing at an exponential rate since 1990, largely as the result of increased use of prostate-specific antigen (PSA) testing for screening.[1] Demographic trends in the next 20 years will exacerbate the effects of changing disease epidemiology by increasing the population of older men at risk for prostate cancer. Statistics Canada projections indicate that the population of men over age 40 will increase from 5.7 million in 1995 to 9 million in 2016, an increase of 57%.[2] New diagnostic and therapeutic procedures — testing for total PSA and free PSA, nerve-sparing radical prostatectomy, cryotherapy, gene therapy and others — continue to be developed and widely used. These will inevitably put additional demands on our health care resources.

Health care needs are unlimited, whereas resources are finite. Public expenditures on health care have to compete with other societal priorities such as education, the environment, defence and infrastructure. Even in relatively wealthy, developed countries, scarcity is the defining characteristic of resource allocation problems. Economic studies are playing an increasing role in helping both clinicians and the institutions that fund and provide health care to evaluate resource allocation challenges in a rational, evidence-based manner.

Defining and estimating the cost of disease

The economic burden of any disease can be defined in terms of the direct and indirect costs incurred by patients and society as a whole. The direct costs reflect the value of goods and services for health care or resources that could have been used for other purposes in the absence of illness.[3] These include the costs of care provided by physicians and other health care professionals, care provided in hospitals and other health care institutions, drugs, laboratory services and research. The indirect costs represent the reduced productivity associated with lost or impaired ability to work because of illness and the loss of economic productivity because of premature death. Thus, we can distinguish between morbidity costs and mortality costs. Indirect costs are more elusive than direct costs, because economic valuation of life in sickness and in health is beset by methodologic and measurement difficulties.

There are 2 main approaches to estimating indirect costs: the human capital method and the willingness-to-pay approach. The first evaluates productivity lost because of disability or premature death, on the basis of lost earnings.[4–7]

This 13-part series was made possible in part by an unrestricted educational grant from ZENECA Pharma

This 13-part series was made possible in part by an unrestricted educational grant from Pharmacia & Upjohn Inc.

Conversely, the willingness-to-pay approach considers the amount people are willing to pay to reduce the risk of illness or death.[4–6,8] In most instances, willingness-to-pay estimates are higher than those based on foregone earnings. The human capital approach, although widely used because of the availability of reliable statistics on individual income and earnings, is often criticized because it tends to discriminate against economically disadvantaged people and groups with lower rates of participation in the labour force, such as women, young people, those with disabilities and elderly people.

Direct costs of prostate cancer

Because prostate cancer develops slowly and affects men in the later stages of their lives, one might expect most prostate cancer costs to be associated with direct health care expenditures (related to detection, initial and follow-up treatments, and treatments of complications due to these interventions) rather than the indirect costs associated with illness and death. According to Health Canada estimates,[3] of the $72 billion in total direct costs for all diseases in 1993, direct costs for all forms of cancer amounted to $3.2 billion, and of this amount, more than three-quarters was spent on hospital care alone; physician fees, drugs and research accounted for much smaller proportions of the total (Fig. 1).

Unfortunately, no Canadian data are available on the direct costs of prostate cancer. However, in The Netherlands, prostate cancer accounted for 5% to 6% of direct health care costs for all cancers in 1988.[9] In Sweden these costs have been estimated at 5.8% of the total costs for all tumours.[10] If a similar percentage is assumed for Canada, the direct costs of treating prostate cancer in this country could be estimated at $193 million. This seems relatively small in relation to other diseases (Table 1).

In Sweden the average cost per patient from diagnosis until death was estimated at $12 400 (in 1985 US dollars).[10] Approximately 25% of total costs for medical care were incurred during the first year after diagnosis. Hospital costs were responsible for the largest share of the total (72%), whereas drugs accounted for approximately 15% of the total. A Norwegian study demonstrated substantial requirements for treatment and care from diagnosis until death, even among patients treated conservatively (i.e., with noncurative intent).[11] For instance, 49% of the patients reported complications requiring admission to hospital, 66% required various prostatic surgical procedures, and 76% needed androgen ablation. Palliative irradiation was given to 16% of the patients, and half received analgesics regularly.

In the United States the cost of treatments for localized prostate cancer was estimated at $10 000 to $20 000 per patient; estimates for treatment of advanced disease ranged from $30 000 to $100 000 per patient.[12] In an analysis of data from a health maintenance organization, the costs of initial care — within the first 6 months after diagnosis — were estimated at $1500 per month (in 1992 US dollars) among men 65 to 79 years old.[13] Surprisingly, the costs of initial care did not vary much with stage of disease or coexisting conditions but did decrease with age

Table 1: Direct costs of selected diseases in Canada, 1993*

Disease or condition	Estimated cost, $ (and %)	
Prostate cancer†	193	(0.3)
Breast and female genital cancers	329	(0.5)
All cancers	3 222	(4.5)
Birth defects	305	(0.4)
Diabetes	577	(0.8)
Infectious and parasitic diseases	787	(1.1)
Stroke	1 445	(2.0)
Coronary heart disease	2 075	(2.9)
All diseases	71 743	(100)

*Source: Moore and associates.[3]
†Estimate is based on the assumption that 6% of direct costs for all cancers is attributable to prostate cancer.

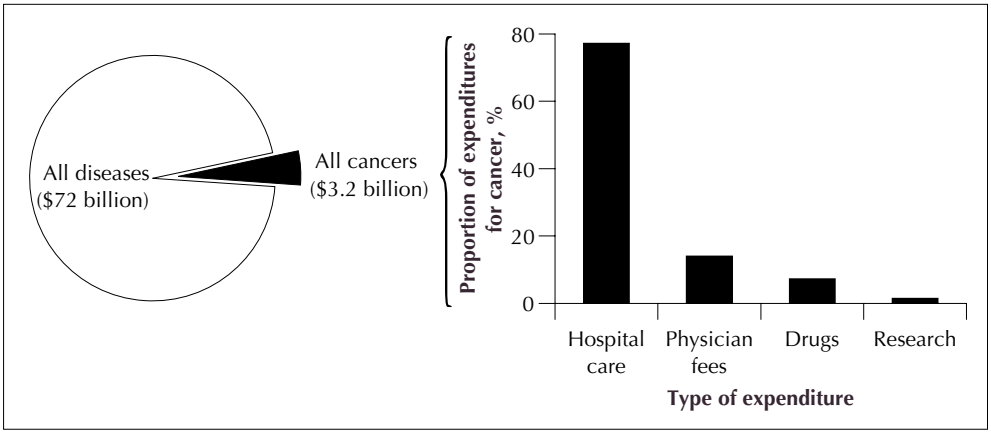


Fig. 1: Total direct costs for all diseases in 1993 and breakdown of cancer costs by category.

to $1100 per month for those over 80. The mean cost of continuing care was estimated at $500 per month. The cost of terminal care — care during the last 6 months of life — increased substantially, to over $2700 per month, depending on the stage of the cancer, the patient's age and the extent of coexisting conditions. In a Canadian study of patients with end-stage prostate cancer, the monthly cost of total medical care for those treated with strontium-89 (excluding the initial costs of the strontium) was estimated at $1404 per patient (in 1989 Canadian dollars).[14]

Although these studies provide estimates of the direct costs of prostate cancer, the data may be rapidly becoming dated. Patterns of care for prostate cancer changed dramatically between 1984 and 1990.[15] Among patients in whom prostate cancer had been newly diagnosed, use of PSA testing increased from 5% in 1984 to 66% in 1990, and the use of transrectal ultrasonography rose from less than 1% to 20% during this time. Use of CT and MRI also increased in this patient group, from 20% to 34% and from 2% to 5% respectively, between 1984 and 1990. Overall, the use of diagnostic tests increased, whereas the proportion of abnormal findings did not. Use of radical prostatectomy as the initial treatment increased from 9% of patients in 1984 to 24% in 1990; the use of radiation therapy remained unchanged. On the other hand, the proportion of patients in whom cancer had been newly diagnosed and who were receiving no initial treatment declined from 36% in 1984 to 29% in 1990.[15,16] These trends have contributed significantly to the increases in the costs of prostate cancer treatment.

In Canada there is little information on the changing patterns of prostate cancer care compatible with the data from the United States. However, some fragmented provincial data are available. For example, in Saskatchewan the use of PSA testing increased from 100 tests per month in 1990 to more than 4000 in 1994.[17] Concordantly, the number of prostate biopsies increased substantially over the same period. However, prostate cancer was diagnosed in only 35% of the men with abnormal PSA levels (greater than 10 ng/mL) who underwent biopsy. The use of PSA testing also increased exponentially in Ontario[18] and elsewhere in Canada between 1988 and 1996.

In Ontario the annual number of radical prostatectomy procedures among men over 49 years of age increased from 239 in 1989 to 1081 in 1994.[19] The largest increases were among men 50–64 years of age. The hospital admission costs associated with radical prostatectomy and orchidectomy in Canada have recently been calculated (by S.A.G. and colleagues, using methodology of the Canadian Institute for Health Information[20]) (Table 2). The physician fees associated with these hospital admissions have been estimated on the basis of the mean of the Ontario and Quebec reimbursement schedules.[21–23] The hospital cost of radical prostatectomy has been estimated at $6825 and the associated physician fees at $1442. Accordingly, the increase in the number of radical prostatectomies performed between 1989 and 1994 in Ontario alone might have resulted in $7 million in additional expenditures.

Prostate cancer is a disease that evolves over a relatively long period. Hence, the costs of follow-up treatment may be particularly important. For example, in the United States the 5-year cumulative incidence of additional cancer treatment after radical prostatectomy was recently estimated at 35%.[24] Even for patients with pathologically organ-confined cancer, the 5-year cumulative incidence was 24%. Thus, the costs of follow-up treatments, even for cancers that are clinically insignificant at diagnosis, may be substantial.

The costs of treating complications arising from initial treatment could be significant as well. For example, serious cardiopulmonary complications requiring admission to hospital occurred in 7% of men aged 75–79 years after radical prostatectomy.[25] These morbidity rates increased to 10% for those aged 80 and over. In a review of treatments for localized prostate cancer,[26] average mortality rates due

Table 2: Mean hospital costs and length of stay for patients with prostate cancer*

Type of hospital care	Mean length of stay, d	Costs, $		
		Hospital charges	Physician fees	Total
Initial therapy				
Radical prostatectomy	7.7	6825	1442	8 267
External-beam radiotherapy†	—‡	4860	400	5 260
Endocrine therapy (orchidectomy)	1.0	1105	585	1 689
Treatment of complications after initial therapy				
Bowel or rectal surgical injury	12.2	10 030	758	10 788
Urethral stricture	1.0	512	329	842
Implantation of urinary sphincter	1.0	4 649	530	5 179
Penile prosthesis	1.0	4 649	391	5 041
Cardiopulmonary complications	7.4	5 565	376	5 941
Vascular complications	7.4	4 079	317	4 396
Radiation-related complications				
Cystitis	5.4	3 098	246	3 345
Hematuria	3.3	2 018	178	2 196
Proctitis or rectal stricture	1.0	695	271	966
Diarrhea	4.0	2 627	200	2 827

*Source: S.A. Grover and colleagues (unpublished data), except as noted otherwise. Costs are in 1996 Canadian dollars.
†Source: reference 37.
‡This type of therapy is provided mainly on an outpatient basis in hospital clinics.

to radical prostatectomy and external-beam radiation therapy were estimated at 1.1% and 0.2% respectively. The probability of becoming incontinent after surgery or radiation was estimated at 27% and 6% respectively. The prevalence of complete incontinence was estimated at 7% for patients who had undergone surgery and over 1% for those who had undergone radiation therapy. Impotence was estimated to occur in 85% of patients who had undergone surgery and 41% of those who had undergone radiation therapy. Canadian hospital admission costs for treating complications arising from the initial surgery or radiation therapy have also been calculated (Table 2). Clearly these costs are important.

There are at present no Canadian estimates of the total expenditures on drugs associated with the treatment of prostate cancer. However, of the total $234 million spent on drug expenditures for all forms of cancer in 1993, 26% ($60 million) was spent on breast and female genital cancers.[3] Given the comparable prevalence of prostate cancer and the common use of androgen blockade, one might expect substantial drug costs for prostate cancer as well. Moreover, these costs are rising and will continue to increase with greater numbers of patients.

For example, according to data from the Ontario Drug Benefit (ODB) Program,[27] total drug expenditures for prostate cancer treatments among men over 64 years of age increased from $0.2 million in 1985 to over $15 million in 1992 (a 70-fold increase). Over the same period, the ODB Program costs for all drugs increased from $212 million to $646 million (a 3-fold increase).[28] The number of cases of prostate cancer diagnosed annually increased from 2795 in 1985 to 8376 in 1992, and the estimated annual drug cost per cancer patient increased from $77 in 1985 to $1838 in 1992 (a 24-fold increase).[27] At the same time, the ODB Program costs per patient for all drugs increased from $221 to $530 (a 2-fold increase).[28]

Although some of the cost increase for prostate cancer drugs was a result of more cases and increased charges for individual drugs, the majority was due to the use of new drugs. In 1985 most patients were treated with the relatively inexpensive conjugated estrogen diethylstilbestrol, which had become less popular by 1990 because of its cardiovascular side effects.

Teaching points

- The economic burden of prostate cancer is substantial, and, as the so-called baby boomers enter their 50s and 60s, the population of men at risk for prostate cancer will increase rapidly.
- The economic burden of any disease is the sum of the direct and indirect costs to both patients and society.
- Direct costs are costs of care provided by physicians and other health care professionals, care provided in hospitals and other health care institutions, drugs, laboratory services and research.
- Indirect costs represent the reduced productivity associated with inability to work because of illness and the loss of economic productivity because of premature death.

Indirect costs of prostate cancer

At present there are few data on which to base estimates of the costs of disability and premature death caused by prostate cancer in Canada. For all forms of cancer, these costs were calculated at $9.8 billion in 1993.[3] More than $8.8 billion (90%) of this amount was due to the indirect costs associated with premature death. Prostate cancer is responsible for 3.8% of all potential years of life lost.[29] One might, therefore, be tempted to estimate the indirect costs of prostate cancer due to premature death at $334 million in terms of lost productivity, but such a calculation would be crude at best.[30]

Productivity losses have been calculated according to the human capital approach used by Health Canada;[3] this calculation incorporates the value of labour income lost and the replacement value of unpaid work. Most prostate cancer occurs in men aged 70 years and over. Only 15% of Canadians at age 70 are active in the labour force; this proportion drops to 10% at age 75 and to 7% at age 80.[31] At these ages most income is derived from government transfers (public pensions) and accumulated private funds (private pensions and investments). Therefore, the indirect costs of prostate cancer due to premature death estimated by the human capital method may well be less than the $334 million mentioned above. Unfortunately, there are no reported analyses specifically calculating the indirect costs of prostate cancer.

Cost of illness and cost-effectiveness

Why is it important to know the economic burden associated with a given disease? How is this information useful and to whom?

First, cost-of-illness studies allow us to identify, in a broad sense, categories of heavy resource use. They also identify stakeholders in health policy decisions (e.g., pharmaceutical companies and provincial ministries of health) and the relative size of their stakes. Perhaps the most useful role is to facilitate planning for future health care expenditures. It is worth noting, however, that some economists view cost-of-illness studies with suspicion, as they

are often used by various interest groups to increase awareness of a specific intervention or disease.[32–34]

What cost-of-illness studies cannot do is show whether more resources should be devoted to the particular health care intervention or the trade-offs involved in choosing between interventions. Simply revealing that prostate cancer costs X dollars is insufficient to indicate whether we should be spending more on prostate cancer research or on new and exciting treatment Y. Such decisions require cost-effectiveness analyses or economic evaluation.

Economic evaluation helps guide decision-making by outlining the relation between resource consumption and the health outputs of a given program; it provides an assessment of "value for money" or the economic efficiency of an intervention, given limited resources.[35] Cost-effectiveness studies ask the following questions: What are the alternatives to treatment Y? How effective are they? How much do they cost? If Y is more effective, is the gain in effectiveness worth the additional cost? Cost-effectiveness studies never provide a definitive answer to these questions, because they inevitably involve questions of values and ethics. However, they do provide a framework to guide decision-making and a starting point for discussion.

Teaching points

- Cost-of-illness studies allow us to identify general categories of heavy resource use.
- Cost-effectiveness studies can guide health care decisions by estimating the relation between resource use and the health outputs of a given program; they provide an assessment of "value for money."
- As the economic burden of prostate cancer rises over the coming decades, cost-of-illness estimates will allow us to forecast future health care expenditures, and cost-effectiveness studies will show us whether increased spending on early screening, staging, and curative or palliative interventions can be offset by either savings or health benefits.

Cost-effectiveness studies

Within the last 10 years, an increasing number of studies evaluating the cost-effectiveness of prostate cancer screening, diagnosis and treatment modalities have been published. For example, at least 6 studies have evaluated the role of PSA screening.[36–41] All of the studies that measured costs suggested that net costs would increase as a result of screening. Four of the 6 suggested that the harmful consequences of screening might offset the potential health benefits associated with early detection.[36–38,41] Two studies suggested that PSA screening might be "cost effective" or economically attractive.[39,40] The heterogeneity of these results is accounted for by differences in methods, lack of high-quality data describing costs and the quality-of-life effects of screening, and, in particular, the lack of data from randomized controlled trials characterizing the effects of screening or treatment on death from cancer. Until such data are published, the cost-effectiveness of PSA screening will be highly speculative.

In addition to research on screening, studies are now being published that evaluate the cost-effectiveness of the entire diagnostic and treatment cascade. Such studies consider the role of second opinion pathological review,[42] less invasive[43] or less expensive[44,45] staging strategies, early discharge after radical prostatectomy,[46] the use of flutamide[47,48] and the use of palliative chemotherapy for end-stage disease.[49]

Future economic trends

Health care expenditures on prostate cancer are likely to rise in the near future. Even if incidence rates were to remain at their present level, the aging of the population will increase the prevalence of prostate cancer over the next 20 years. Cost-of-illness studies will help to forecast future health care expenditures. Cost-effectiveness studies will determine whether increased spending on early screening, staging, and curative or palliative interventions can be offset by either cost savings or sufficient health benefit (e.g., cancers cured, lives saved or painful metastatic disease prevented) to warrant additional expenditures. To answer these questions, all relevant costs must be accounted for and the clinical evidence of the effectiveness of various prostate cancer treatments must be demonstrated.

Major gaps in scientific knowledge remain as barriers to good economic analyses. The largest of these is the absence of results of randomized controlled trials evaluating the efficacy of alternative screening, staging and treatment interventions. Such trials are under way in the United States and Europe and are planned for Canada. In addition, quality-of-life effects of treatment and screening are not well understood, although evidence is slowly accumulating. Little is known about the utilization patterns of health care services by Canadian urologists and other physicians in the treatment of prostate cancer. Finally, information on outcomes according to age, stage and grade of cancer, and treatment modalities, although difficult to collect, will prove essential in projecting future health care requirements. Better quality data will put future cost-of-illness studies

and, in particular, cost-effectiveness analyses, on a much firmer foundation.

We thank our research assistants Daniel Roth and Annie Bérubé.

References

1. Levy IG, Iscoe NA, Klotz LH. Prostate cancer: 1. The descriptive epidemiology in Canada. *CMAJ* 1998;159(5):509-13.
2. *Population projections for Canada, provinces and territories 1993–2016*. Ottawa: Statistics Canada; 1993. Cat no 91-520.
3. Moore R, Mao Y, Zhang J, Clarke K. *Economic burden of illness in Canada, 1993*. Ottawa: Health Canada; 1997.
4. Cooper BS, Rice DP. The economic costs of illness revisited. *Soc Secur Bull* 1976;39:21-36.
5. Hodgson TA. The state of the art of cost-of-illness estimates. *Adv Health Econ Health Serv Res* 1983;4:129-64.
6. Robinson JC. Philosophical origins of the economic valuation of life. *Millbank Q* 1986;64:133-55.
7. Rice DP. Estimating the cost of illness. Washington: US Department of Health, Education and Welfare; 1966. Public Health Service, Health Economics Series 6.
8. O'Brien B, Viramontes JL. Willingness to pay: a valid and reliable measure of health state preference. *Med Decis Making* 1994;14:289-97.
9. Koopmanschap MA, Roijen LV, Bonneux L, Barendregt JJ. Current and future costs of cancer. *Eur J Cancer* 1994;30A:60-5.
10. Carlsson P, Hjertberg H, Jönsson B, Barenhorst E. The cost of prostatic cancer in a defined population. *Scand J Urol Nephrol* 1989;23:93-6.
11. Otnes B, Harvei S, Fossa SD. The burden of prostate cancer from diagnosis until death. *Br J Urol* 1995;76:587-94.
12. Denmeade SR, Isaacs JT. Prostate cancer: Where are we and where are we going? *Br J Urol* 1997;79(Suppl 1):2-7.
13. Taplin SH, Barlow W, Urban N, Mandelson MT, Timlin DJ, Ichikawa L, et al. Stage, age, comorbidity, and direct cost of colon, prostate, and breast cancer care. *J Natl Cancer Inst* 1995;87:417-26.
14. McEwan AJB, Amyotte GA, McGowan DG, MacGillivray JA, Porter AT. A retrospective analysis of the cost effectiveness of treatment with Metastron (^{89}Sr-chloride) in patients with prostate cancer metastatic to bone. *Nucl Med Commun* 1994;15:499-504.
15. Jones GW, Mettlin C, Murphy GP. Patterns of care for carcinoma of the prostate gland: results of a national survey of 1984 and 1990. *J Am Coll Surg* 1995;180:545-54.
16. Mettlin C, Jones GW, Murphy GP. Trends in prostate cancer care in the United States, 1974–1990: observations from the patient care evaluation studies of the American College of Surgeons Commission on Cancer. *CA Cancer J Clin* 1993;43:83-91.
17. *The PSA test in early detection of prostate cancer*. Saskatoon: Health Services Utilization and Research Commission; 1995.
18. Bunting PS, Miyazaki JH, Goel V. Laboratory survey of prostate-specific antigen testing in Ontario. *Clin Biochem* 1998;31:47-9.
19. Variations in selected surgical procedures and medical diagnoses by year and region. In: Goel V, Williams JI, Anderson GM, Blackstien-Hirsch P, Fooks C, Naylor CD, editors. *Patterns of health care in Ontario: the ICES practice atlas*. 2nd ed. Ottawa: Canadian Medical Association; 1996. p. 51-146.
20. *Resource intensity weights: summary of methodology, 1996/97*. Ottawa: Canadian Institute for Health Information; 1996.
21. *Manuel des médecins omnipraticiens*. Quebec City: Régie de l'assurance-maladie du Québec; 1996.
22. *Manuel des médecins spécialistes*. Quebec City: Régie de l'assurance-maladie du Québec; 1996.
23. *Schedule of benefits: physician services, 1992*. Toronto: Ontario Ministry of Health; 1992.
24. Lu-Yao GL, Potosky AL, Albertsen PC, Wasson JH, Barry MJ, Wennberg JE. Follow-up prostate cancer treatments after radical prostatectomy: a population-based study. *J Natl Cancer Inst* 1996;88:166-73.
25. Lu-Yao GL, McLerran D, Wasson J, Wennberg JE. An assessment of radical prostatectomy: time trends, geographic variation, and outcomes. *JAMA* 1993;269:2633-6.
26. Wasson JH, Cushman CC, Bruskewitz RC, Littenberg B, Mulley AG Jr, Wennberg JE. A structured literature review of treatment for localized prostate cancer [published erratum in *Arch Fam Med* 1993;2:1030]. *Arch Fam Med* 1993;2:487-93.
27. To T, Iscoe N, Klotz L, Naylor CD. Orchiectomy and hormonal therapy of prostate cancer. *Can J Urol* 1995;2:109-15.
28. Anderson GM. An overview of the use of acute care hospitals, physician and diagnostic services and prescription drugs. In: Naylor CD, Anderson GM, Goel V, editors. *Patterns of health care in Ontario: the ICES practice atlas*. 1st ed. Ottawa: Canadian Medical Association; 1994. p. 21-45.
29. *Canadian cancer statistics 1997*. Toronto: National Cancer Institute of Canada; 1997.
30. Morrison HI, MacNeill IB, Miller D, Levy I, Xie L, Mao Y. The impending Canadian prostate cancer epidemic. *Can J Public Health* 1995;86:274-8.
31. Norland JA. *Focus on Canada: profile of Canada's seniors*. Ottawa: Statistics Canada; 1994. Cat no 96-312E.
32. Drummond MF. Cost-of-illness studies: A major headache? *Pharmacol Econ* 1992;2:1-4.
33. Shiell A, Gerrard K, Donaldson C. Cost of illness studies: An aid to decision-making? *Health Policy* 1987;8:317-23.
34. Hodgson TA. Cost of illness studies: No aid to decision-making? *Health Policy* 1989;11:57-60.
35. Gold MR, Russell LB, Siegel JE, Weinstein MC, editors. *Cost-effectiveness in health and medicine*. Oxford: Oxford University Press; 1996.
36. Krahn MD, Mahoney JE, Eckman MH, Trachtenberg J, Pauker SG, Detsky AS. Screening for prostate cancer: a decision analytic view. *JAMA* 1994;272:781-6.
37. Optenberg SA, Thompson IM. Economics of screening for carcinoma of the prostate. *Urol Clin North Am* 1990;17:719-37.
38. *Screening for cancer of the prostate: an evaluation of benefits, unwanted health effects and costs*. Montreal: Conseil d'évaluation des technologies de la santé du Québec; 1995.
39. Littrup PJ, Goodman AC, Mettlin CJ. The benefit and cost of prostate cancer early detection. *CA Cancer J Clin* 1993;43:134-49.
40. Coley CM, Barry MJ, Fleming C, Fahs MC, Mulley AG. Early detection of prostate cancer. Part II: Estimating the risks, benefits, and costs. *Ann Intern Med* 1997;126:468-79.
41. Cantor SB, Spann SJ, Volk RJ, Cardenas MP, Warren MM. Prostate cancer screening: a decision analysis. *J Fam Pract* 1995;41:33-41.
42. Epstein JI, Walsh PC, Sanfilippo F. Clinical and cost impact of second-opinion pathology: review of prostate biopsies prior to radical prostatectomy. *Am J Surg Pathol* 1996;20:851-7.
43. Perrotti M, Gentle DL, Barada JH, Wilbur HJ, Kaufman RPJ. Mini-laparotomy pelvic lymph node dissection minimizes morbidity, hospitalization and cost of pelvic lymph node dissection. *J Urol* 1996;155:986-8.
44. Forman HP, Fox LA, Glazer HS, McClennan BL, Anderson DC, Sagel SS. Chest radiography inpatients with early stage prostatic carcinoma. Effect on treatment planning and cost analysis. *Chest* 1994;106:1036-41.
45. Forman HP, Heiken JP, Brink JA, Glazer HS, Fox LA, McClennan BL. CT screening for comorbid disease in patients with prostatic carcinoma: Is it cost-effective? *Am J Roentgenol* 1994;162:1125-8.
46. Licht MR, Klein EA. Early hospital discharge after radical retropubic prostatectomy: impact on cost and complication rate. *Urology* 1994;44:700-4.
47. Hillner BE, McLeod DG, Crawford ED, Bennett CL. Estimating the cost effectiveness of total androgen blockade with flutamide in M1 prostate cancer. *Urology* 1995;45(4):633-40.
48. Bennett CL, Matchar D, McCrory D, McLeod DG, Crawford ED, Hillner BE. Cost-effective models for flutamide for prostate carcinoma patients. Are they helpful to policy makers? *Cancer* 1996;77:1854-61.
49. Bloomfield DJ, Krahn MD, Neogi T, Panzarella T, Smith TJ, Warde P, et al. Economic evaluation of chemotherapy with mitoxantrone plus prednisone for symptomatic hormone-resistant prostate cancer: based on a Canadian randomized trial with palliative end points. *J Clin Oncol* 1998;16:2272-9.

Reprint requests to: *Dr. Steven A. Grover, Centre for the Analysis of Cost-Effective Care, Montreal General Hospital, 1650 Cedar Ave., Montreal QC H3G 1A4*

The following organizations are members of the Prostate Cancer Alliance of Canada: Canadian Association for Nurses in Oncology, Canadian Association of Radiation Oncologists, Canadian Cancer Society, Canadian Prostate Cancer Network, Canadian Prostate Cancer Research Foundation, Canadian Urology Association, Canadian Uro-Oncology Group and National Cancer Institute of Canada.