RESEARCH

Trends in Prostate Cancer Incidence, Hospital Utilization and Surgical Procedures, Canada, 1981-2000

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ABSTRACT

Background: Numbers of new prostate cancer cases in Canada continue to increase because of increasing prostate cancer incidence, population growth, aging of the population, and earlier detection methods such as PSA (prostate-specific antigen) testing. Concern has been expressed that PSA-related increases in incidence will make unaffordable demands on Canadian hospital resources. Our objective is to relate increases in prostate cancer incidence to trends in hospitalizations and in- patient treatment.

Methods: Hospitalizations with prostate cancer as primary diagnosis were obtained from the Hospital Morbidity Database, estimates of prostate cancer day surgery from the Discharge Abstract Database, newly diagnosed cases from the Canadian Cancer Registry, and prostate cancer deaths from the Vital Statistics Mortality Databases – all for the years 1981-2000.

Results: Between 1981-2000, the number of new cases rose from 7,000 to 18,500 with a transient peak, 1991-1994. Hospitalizations rose parallel to the incidence until 1991 but then fell sharply in spite of further increasing incidence. The use of radical prostatectomy (RP) increased steadily, but transurethral prostatectomy and bilateral orchiectomy decreased in the 1990s. Decreases in length of stay and in number of hospitalizations resulted in considerably decreased annual hospital days for all prostate cancer in-patient procedures except RP, which remained level since 1993.

Conclusions: A net decrease in number of in-patient days occurred, despite the increasing number of new prostate cancer cases and the increasing use of radical prostatectomy. We concluded that increases in hospital utilization due to early detection programs, such as PSA testing, are unlikely to overwhelm in-patient services of Canadian hospitals.

MeSH terms: Trends, prostate cancer; surgery; hospital utilization; prostatectomy; orchiectomy

La traduction du résumé se trouve à la fin de l'article.

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Prostate cancer incidence rates in Canada show a sharp peak in 1990-1994 superimposed on the already increasing trends.[1-5] This peak in prostate cancer incidence is generally attributed to the earlier detection by prostate-specific antigen (PSA) testing which became available in Canada in 1986 and gained widespread use in the early 1990s.[4] While the increased diagnosis of prostate cancer was accompanied by increases in cases with localized disease, and decreases in cases with distant metastases,[6-10] the effectiveness of the PSA test in saving lives is not yet proven,[9-11] since biases (such as lead-time) and over-detection biases cannot yet be ruled out.[12-15] There is concern that large increases in new cases related to PSA testing and an aging population will significantly increase demands upon Canadian in-patient hospital resources without sufficient benefit.[16] Yet, numbers of hospitalizations and lengths of stays have decreased for other cancers in spite of increasing incidences,[17] and this may be true for prostate cancer as well. At the same time, changes are occurring in patterns of surgical treatment and other developments in the health care system – such as fiscal restraints, or increased use of day surgery – are occurring.[3] Our objectives will be to examine trends in hospital utilization and in-patient surgical treatments, and to evaluate to what extent such trends were impacted by increasing incidence rates of prostate cancer, especially those attributable to PSA testing.

METHOD

Data sources included the Hospital Morbidity File (HMF), the Discharge Abstract Database (DAD), the Canadian Cancer Registry (CCR) and the Vital Statistics Mortality Database (VSMD). HMF supplied data on all in-patient hospitalizations from each province and territory for the fiscal years 1981/82 to 2000/01. Fiscal years will be denoted as single years, e.g., the fiscal year April 1, 1981 to March 31, 1982 will be designated 1981. These data are event-oriented, meaning that separate hospital stays for a person will be treated as separate events. The study population was based on primary diagnoses of prostate cancer (ICD-9: 185); if secondary cancers were found (ICD-9 197.0-199.1) in other diagnostic

fields, the cancer was considered metastatic or distant. In-hospital surgical procedures were coded according to the Canadian Classification of Diagnostic and Therapeutic Procedures (CCP), i.e., 72.1 for transurethral prostatectomy (TURP), 72.4 for radical prostatectomy (RP), 74.3 for bilateral orchiectomy (BO), and 72.2, 72.3, or 72.5 for other prostatic surgery. Information for the latter category is not always provided because of small numbers. Non- surgical categories were 'other procedures', or 'no procedure' if the procedure code was blank.

The CCR provided incidence data while the VSMD provided deaths with prostate cancer as underlying cause of death. The DAD supplied data on the prostate cancer surgical procedures by day surgery for Newfoundland and Labrador, Prince Edward Island, Ontario, Saskatchewan, and British Columbia, which were then used to estimate the national rates.

Age-specific rates were calculated with the denominator estimated from the Canadian census data, and age-standardized rates used the 1991 Canadian population as standard population. Both mean and median length of stay (LOS) were calculated. For patients with hospital stays of one year or more, days in hospital was set at 365 days to decrease the undue effect of long stays and also because longer LOS would overlap the years.

TABLE I

Hospitalization with Primary Diagnosis for Prostate Cancer, 1981-2000

		1981-84	1985-88	1989-92	1993-96	1997-00
All Separations		52,031	61,691	69,591	59,106	49,982
Age	<40	78	77	47	59	29
	40-49	215	228	298	463	653
	50-59	3573	3700	4137	5201	6956
	60-69	14,088	17,380	20,383	19,574	17,757
	70-79	22,045	25,760	28,380	21,215	15,019
	80+	12,032	14,546	16,346	12,594	9568
Radical prostatectomy	N	726	2137	6007	12,815	18,243
	Mean LOS†	23.7	18.3	13.21	8.9	6
	Median LOS	21	16	11	8	5
Other prostatectomy (Non TUR)*	N	749	803	846	1066	1070
	Mean LOS	19.1	17.4	13.4	9.3	5.4
	Median LOS	16	15	12	8	5
Bilateral orchiectomy	N	3784	5443	7460	5080	2062
	Mean LOS	12.2	10.2	7.4	5.2	4.8
	Median LOS	7	5	3	2	1
TUR prostatectomy	N	18,057	22,149	24,903	18,193	13,511
	Mean LOS	13.6	11.6	9.4	6.7	4.9
	Median LOS	10	8	7	5	3
Other procedures	N	16,688	18,230	17,682	12,249	8369
	Mean LOS	17.9	17.8	14.5	14.1	11.6
	Median LOS	9	8	7	6	6
No procedure	N	12,027	12,929	12,693	9703	6727
	Mean LOS	27.51	26.15	21.92	18.76	14.45
	Median LOS	10	9	8	7	7

Source: Hospital Morbidity database.
* TUR=transurethral
† LOS = length of stay in hospital in days

RESULTS

During 1981-2000, 292,401 hospitalizations occurred in Canada with a primary diagnosis of prostate cancer, mostly for men aged 60-79 (Table I). Many changes occurred over this time: new cases more than doubled with a superimposed peak, 1991-1994; hospitalizations increased until1990, then decreased in spite of still rising incidence; deaths increased until 1995, after which mortality decreased (Figure 1).

Trends in the numbers of in-patient surgeries showed RP becoming the major reason for surgical hospital stays while TURP decreased from 80% to 40% (Figure 2a). Age- standardized rates (Figure 2b) showed increasing trends in RP with a small peak corresponding to the PSA-related peak in incidence rates, but decreasing trends in TURP and BO. Information on day surgeries indicated that RPs were never performed as day surgery; TURP day surgery reached no more than 4% by 2000; while for BO, day surgery went from 8% in 1990, to 28% in 1995 and 41% in 2000 (dotted line).

Age-specific trends show that TURPs and BOs occurred most in the oldest age groups, while RPs were highest for ages 60-69 and had very low rates for the elderly (Figure 3). Only RP rates showed the superimposed incidence peak, especially for ages 60-69. The non-surgical categories (Figures 3c and 3d) started high and decreased, especially for the oldest age groups.

At the same time hospitalizations for prostate cancer were decreasing, LOS also decreased for all procedure categories (Table I). For hospital stays longer than 12 months (0.15%), the number of days was set at 365 days – 94% of these were in non-surgical categories. The mean LOS for all prostate cancer admissions declined from 18 to 8 days in 1981-2000 (not shown) with the steepest decrease for RP. Differences between mean and median illustrate skewness of the data and were least for surgical procedures and greatest for non-surgical categories (Table I). Similarly, total annual days in hospital decreased for each procedure except RP in the early 1990s (Figure 4). Each line in the figure indicates total number of days in hospital for all the surgical procedures below the line, while the distance between the lines indicates number of days for surgical procedure specified. Thus, RP is the only procedure for which the number of days per year are increasing, as shown by the increasing space between the lines.

The proportions of hospital stays with distant cancer and/or discharged as dead indicated the severity of prostate cancer. Less than 1% of hospitalizations for RP and TURP were discharged as dead (1994-2000) and under 8% could be assigned to distant cancer (not shown in tables/figures). For BO, the proportions were 21.0% and 1.4%, respectively; for the 'no procedure' category, 55.0% and 35.8%; and for the 'other procedures' category, 31.0% and 13.5%. Other recorded procedures largely consisted of 'other non-operative cystoscopy,' needle biopsies, and various types of lymph node excision.

DISCUSSION

Considerable changes in diagnoses, hospital admissions, and surgical procedures for prostate cancer occurred in 1981-2000. A peak in incidence superimposed on an already increasing trend in incidence is most

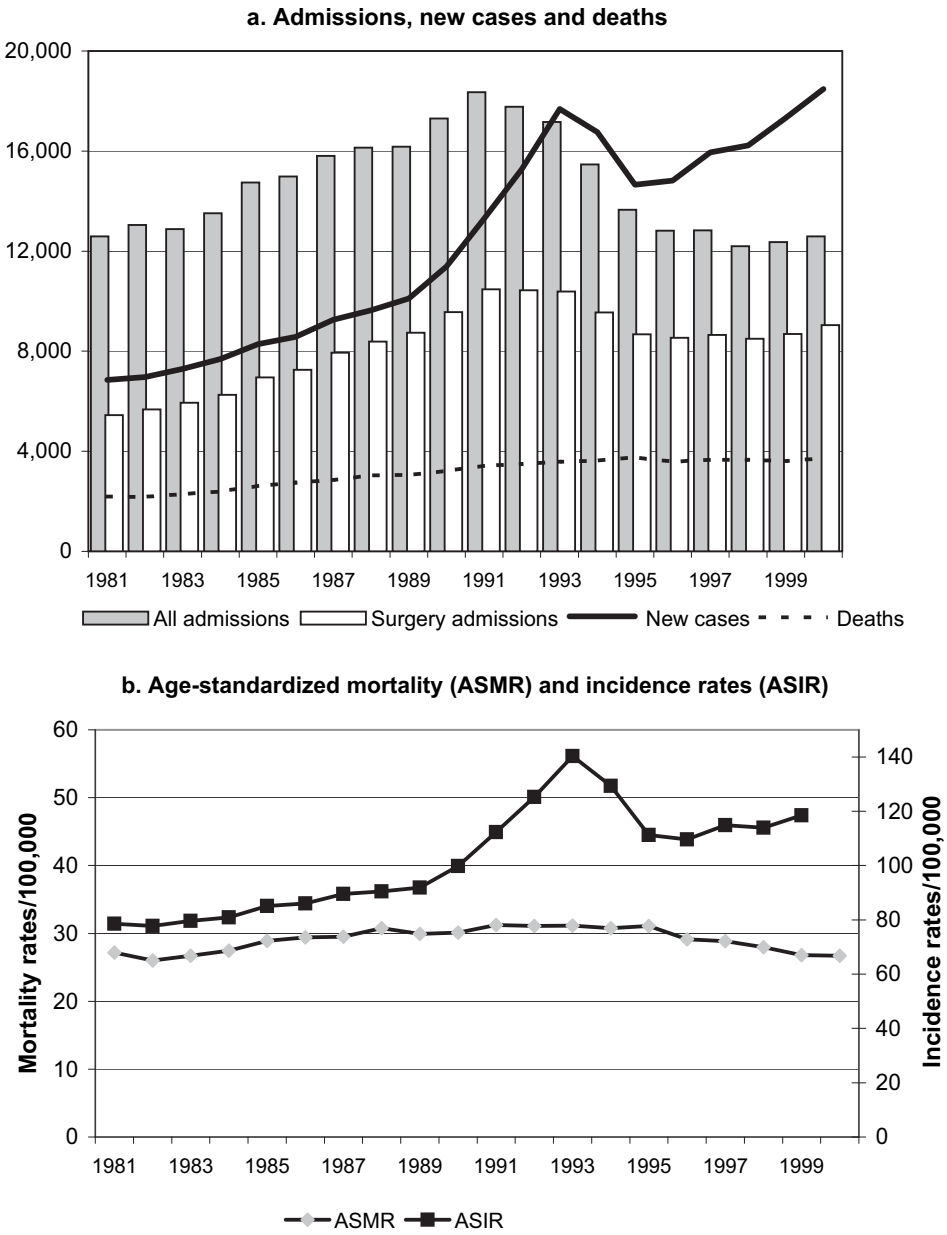

Figure 1. Trends in prostate cancer, Canada
Source: Hospital Morbidity File, Vital Statistics Files, Cancer Registry, Statistics Canada

likely attributable to newly introduced PSA testing. Both newly emerging and diminishing surgical procedures were noted. Decreasing hospital admissions and shorter LOS resulted in decreased total annual days in hospital. Such changes need to be considered alongside other changes in health care and hospital utilization before evaluating the impact on hospital resource utilization from increasing prostate cancer incidence.

Prostate cancer surgical treatment has changed greatly over the years. For example, RP, once rarely used, has become the most common surgical treatment. The small peak in RP use corresponding to the PSA-peak in incidence and the fact that RP is rarely used for cases with distant cancer, confirm the view of others that it is the surgical treatment of choice for localized cancer cases detected early.[18] The finding that men aged 70 and over seldom received RP, reflected the consensus among Canadian urologists that RP is less suitable for elderly men.[19] This choice remains controversial – potentially curative treatment has been shown to enhance life expectancy and quality of life in older men with localized prostate cancer.[20,21]

Both BO and TURP increased in the 1980s, then decreased in the 1990s, confirming other studies.[3,22,23] A potential reason suggested for declining in-patient BO was increasing day surgery,[3] but our results indicate that this explanation is insufficient. More likely, BO is being replaced by other hormonal treatment.[23-25] TURP is most frequently used for the relief of symptoms in benign prostate hyperplasia (BPH) where it may lead to an incidental diagnosis of prostate cancer. Some authors attributed the increase in prostate cancer incidence prior to the PSA peak to this use of TURP.[26] TURP can also be used as a surgical treatment for symptom relief in locally advanced prostate cancer.[27] In our study, TURP was the most frequent procedure as late as 1997; even in 2000, up to 40% of hospital stays with surgical treatments for prostate cancer still involve TURP, most of which appear to be for localized cancer. A possible reason for the high numbers might be that TURP could be done more than once. As many as 23% of men in one study had repeat TURPs.[27] In the present study, each time a repeat TURP is done, it is counted as a separate event. In terms of in-patient hospital resources, this gives an accurate picture, but it may give the wrong impression about the number of patients receiving TURP. Neither TURP nor BO showed signs of being affected by increases in the incidence of prostate cancer related to PSA testing.

Hospital utilization for prostate cancer has changed greatly over the study period. The number of hospital admissions rose alongside the rising incidence up to 1990, but decreased sharply afterwards while new cases continued to rise. Decreasing numbers of hospitalizations and decreasing LOS led to substantial decreases in total hospital days. Few studies analyzed prostate cancer hospitalizations without major surgical procedures, although they consume a substantial, albeit decreasing, proportion of hospital resources. Since many non-surgical patients had distant cancer and/or died in hospital, these categories clearly included many seriously – even terminally – ill patients. Possibly, some of these patients might receive more appropriate treatment in less expensive, more patient- and family-oriented, chronic or palliative care settings.

How was hospital utilization impacted by increases in prostate cancer incidence resulting from early detection, e.g., PSA

testing? Ironically, the year that the PSA-driven rise in new cases appeared, hospitalizations for prostate cancer began to decrease dramatically, largely in response to cost-saving measures.[28] While the surgical procedure most affected by the PSA-related increases in incidence, RP, showed a small peak in hospital days corresponding to the PSA peak in the incidence, total days in hospital did not indicate the expected dramatic increase – in fact, it was the time of greatest decline. While we may conclude that early detection programs such as the PSA test did not increase the use of Canadian hospital resources, we may still question whether a more widespread use of PSA testing could overwhelm hospital resources at some time in the future. Almost half of Canadian men over 50 have ever had a PSA test and one third within the last 12 months, allowing room for greater use.[3,29] Bunting found that PSA testing tended to be initiated by the patient, motivated by concern about prostate cancer.[30] However, 40% of men receiving PSA testing did so to investigate urinary symptoms,[30] and thus were more likely to have prostate cancer. Thus, a more widespread use of PSA testing, i.e., for asymptomatic men, is unlikely to increase prostate cancer detection at the same rate as did first introduction of the test. Existing guidelines do not show great enthusiasm for widespread use of PSA testing. A review of 12 sets of English language guidelines published between 1994-2004 indicated that 9 of these recommended against routine screening of asymptomatic men.[29] Canada seems somewhat more positive toward PSA screening compared to other countries: 2 of the 4 sets of Canadian guidelines[30-33] were relatively positive towards the informed choice of the use of PSA.[31,33] Still, in some jurisdictions, e.g., Ontario, the extra charge for the PSA test might be a deterrent and makes a statement about its value. While this general lack of enthusiasm indicates that drastic increases in PSA testing are unlikely for now, this could change if clear evidence of the effectiveness of PSA testing is shown.

We may conclude that hospital resources at present are not overwhelmed due to early detection techniques such as PSA testing, and are unlikely to be in the near future. Further changes, such as increasing use of day surgery and minimally-invasive surgical techniques, the increasing use of radiation treatment, and a greater use of the less expensive chronic and palliative care facilities, may be expected to further reduce hospital days for prostate cancer.

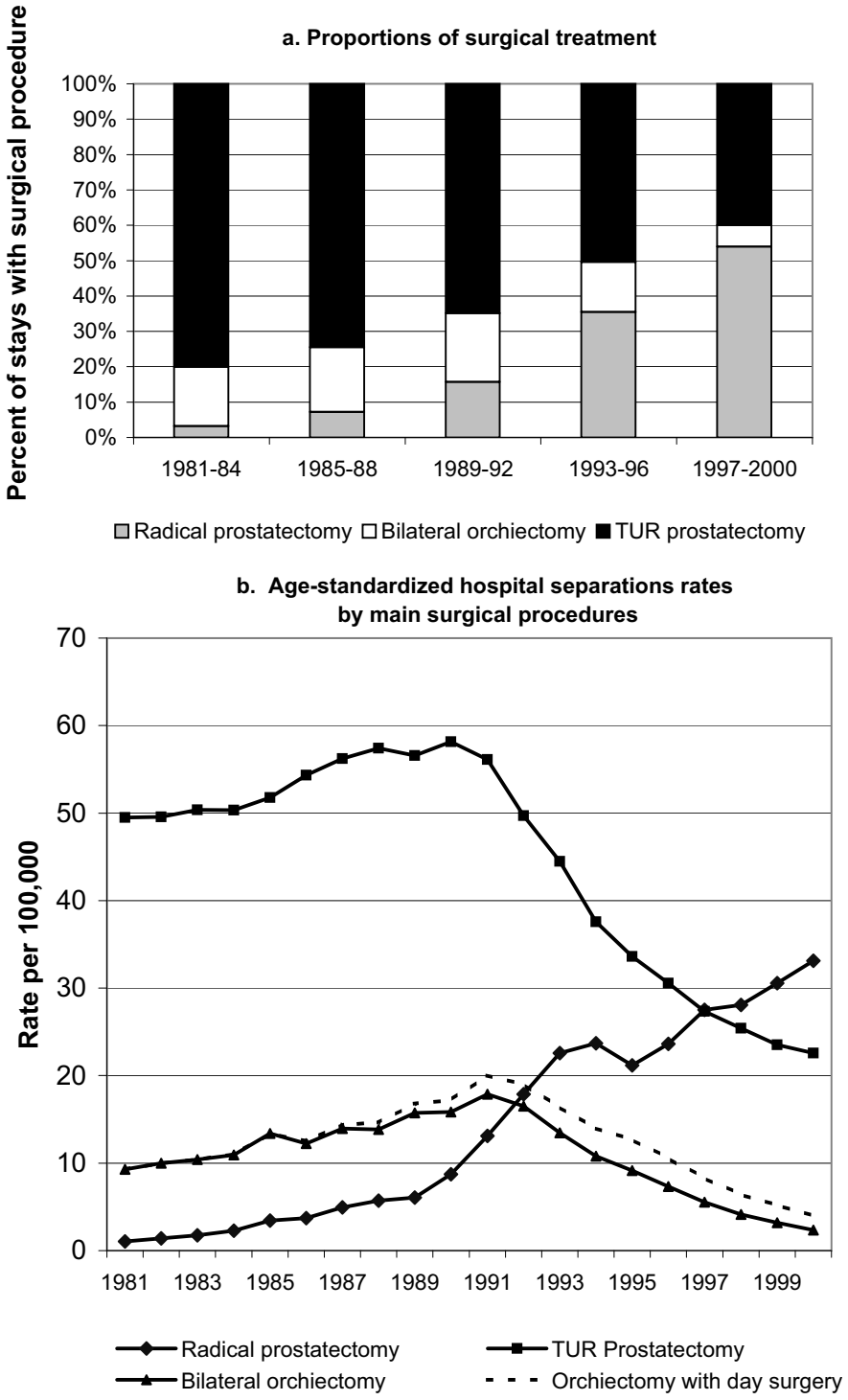

Figure 2. Trends in main surgical procedures for prostate cancer, Canada, 1981-2000
Source: Hospital Morbidity File, Statistics Canada

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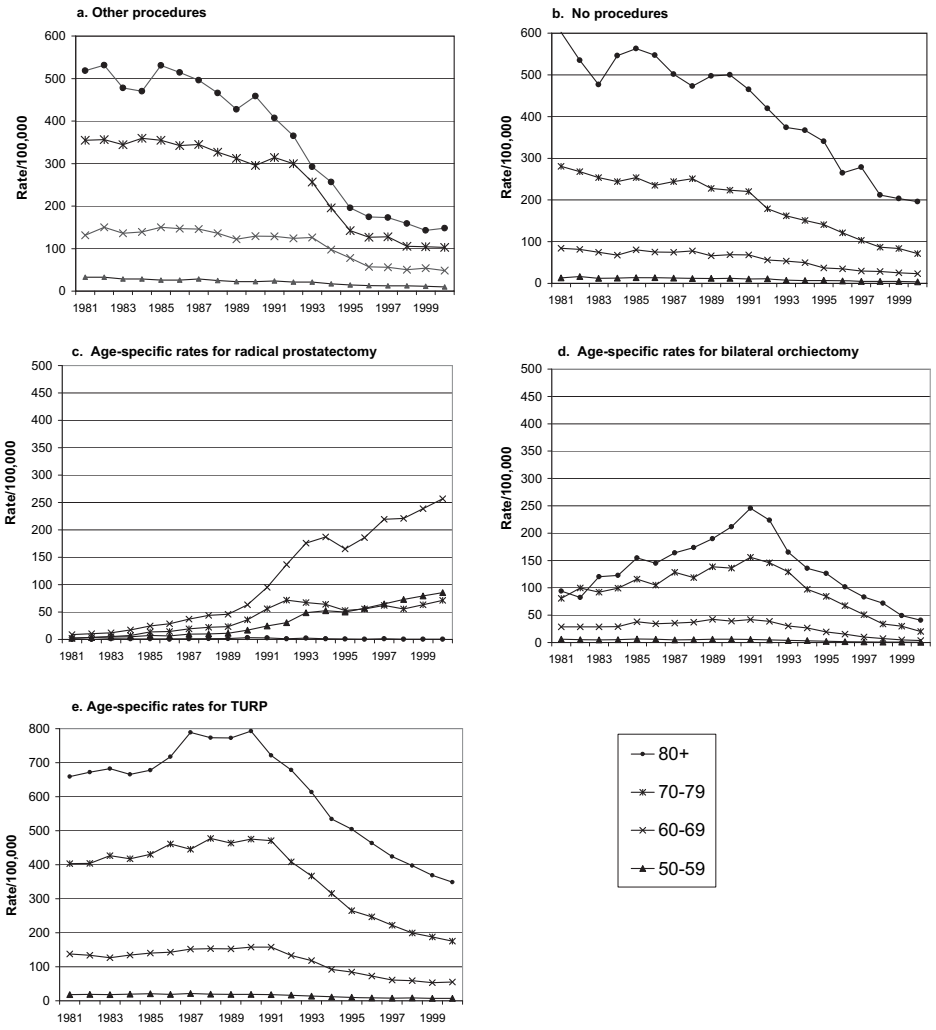

Figure 3. Trends in surgical procedures for prostate cancer, Canada, 1981-2000

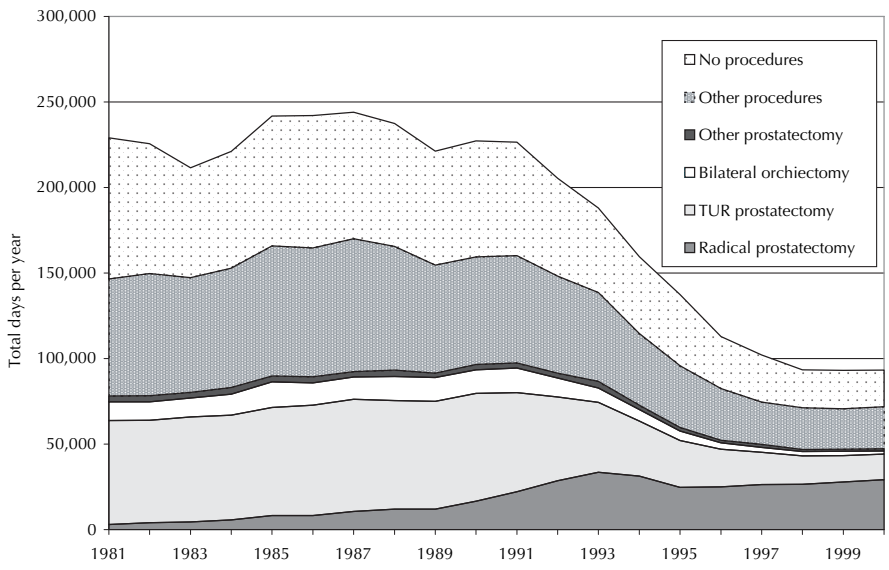

Figure 4. Trends in total annual hospital days by prostrate cancer procedures, prostate cancer as primary diagnosis, Canada, 1981-2000
Source: Hospital Morbidity File, Statistics Canada
Note that the distance betweeen the lines refers to the annual days in hospital for the procedure category specified.

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RÉSUMÉ

Contexte : Le nombre de nouveaux cas de cancer de la prostate au Canada continue d'augmenter annuellement. Au nombre des raisons qui expliquent cette augmentation, on compte la hausse de l'incidence du cancer de la prostate, la croissance et le vieillissement de la population, ainsi que des méthodes de dépistage qui détectent le cancer de la prostate à un stade plus précoce, telles que le test de dépistage de l'antigène prostatique spécifique (PSA). On a exprimé des inquiétudes quant au fait que les augmentations de l'incidence des résultats positifs au test PSA entraîneront des demandes inabordables pour les ressources hospitalières canadiennes. Notre objectif consiste à établir un lien entre les augmentations de l'incidence du cancer de la prostate et les tendances relatives aux hospitalisations et aux traitements prodigués aux patients hospitalisés.

Méthode : Nous avons obtenu, pour la période qui s'échelonne de 1981 à 2000, a) le nombre d'hospitalisations liées au cancer de la prostate comme diagnostic primaire à partir de la Base de données sur la morbidité hospitalière, b) le nombre estimatif de chirurgies d'un jour pratiquées chez des personnes atteintes du cancer de la prostate à partir de la Base de données sur les congés des patients (BDCP), c) le nombre de cas nouvellement diagnostiqués à partir du Registre canadien du cancer, et d) le nombre de personnes qui sont décédées des suites du cancer de la prostate à partir des bases de données sur les décès des statistiques de l'état civil.

Résultats : De 1981 à 2000, le nombre de nouveaux cas est passé de 7 000 à 18 500, atteignant un sommet transitoire pendant la période de 1991 à 1994. Jusqu'en 1991, le nombre d'hospitalisations a augmenté au même rythme que l'incidence, pour ensuite chuter brusquement, malgré une incidence de plus en plus élevée. L'utilisation de la prostatectomie radicale a augmenté de façon constante, tandis que la prostatectomie transurétrale et l'orchidectomie bilatérale ont diminué au cours des années 90. Les diminutions de la durée des séjours à l'hôpital et du nombre d'hospitalisations ont entraîné une diminution considérable du nombre de jours d'hospitalisation par année pour toutes les interventions pratiquées chez des patients hospitalisés atteints du cancer de la prostate, à l'exception de la prostatectomie radicale, qui est demeurée au même niveau depuis 1993.

Conclusions : Malgré le fait que le nombre de nouveaux cas de cancer de la prostate soit en augmentation et que la prostatectomie radicale soit de plus en plus pratiquée, on constate qu'il y a eu une nette diminution de la durée d'hospitalisation des patients. Nous en sommes arrivés à la conclusion qu'il est peu probable que les augmentations dans l'utilisation des services hospitaliers en raison des programmes de dépistage du cancer de la prostate à un stade précoce, tels que le test PSA, aient pour effet de submerger les services aux patients hospitalisés dans les hôpitaux du Canada.