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SHORT COMMUNICATION

Cancer referral and treatment activity 2010–2015: a population-based study from Vancouver Island

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ABSTRACT

Introduction The years since 2005 have seen major changes in cancer treatment and significant increases in the number of anticancer drugs available. However, there are relatively few published data to reflect how those changes are affecting the activity and workload of oncology services. To explore the effects of those changes, we reviewed the population-based cancer treatment activity on Vancouver Island for the period 2010–2015.

Methods Information about new patient referrals, radiation courses, new chemotherapy cycles commenced, total intravenous (IV) chemotherapy treatment visits, and pharmacy activity for oral anticancer drug prescriptions was obtained from BC Cancer Agency databases.

Results During the 5-year study period, the Vancouver Island population increased by 2.8% and the number of new referrals to the BC Cancer Agency increased by 17.7%. The overall number of radiation courses increased by 6.1%. In contrast, IV chemotherapy activity increased by 52.1% for new courses commenced and by 62% for total IV chemotherapy attendances. Oral anticancer drug prescriptions rose by 22.9% during the 5-year period.

Conclusions Our study documents substantial recent increases in cancer therapy activity in terms of patient referrals and particularly IV chemotherapy and oral anticancer therapy. The data reported here could be of value in planning for future care provision.

Key Words Population data, chemotherapy, workload, radiotherapy

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INTRODUCTION

Cancer treatment is evolving rapidly, with developments in radiation oncology and surgery; however, the more significant advances have occurred in cancer drug treatment. Since the early 2000s, a major increase in the number of cancer drugs available has occurred, with more than 50 new agents introduced[1].

The impact of those advances has been to increase the range of diagnoses and the age range of patients who are able to receive treatment. However, only a few of the new drugs have directly replaced a pre-existing therapy, and the overall outcome has been to increase the number of lines of treatment available for many patients. As a result, it is likely that the volume of cancer treatment delivered will increase substantially, potentially leading to financial and organizational challenges[1,2]. The economic issues associated with funding new cancer drugs have been well documented in the medical and political literature[3,4]. In contrast, the impact on staffing and facilities for treatment delivery is less well documented[4,5].

To assess the recent changes in cancer treatment activity, we reviewed the numbers of referrals, radiation courses, intravenous (IV) chemotherapy visits, and oral chemotherapy prescriptions during a 5-year period. On Vancouver Island, the BC Cancer Agency (BCCA), through its clinics and the associated Island Health Communities Oncology Network, is the sole provider of radiation therapy, IV chemotherapy, and almost all oral cancer-treatment

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medications for the population. This limited distribution of care provision allows for the compilation of accurate data about changes in population treatment activity during the study period.

METHODS

Population, Referrals, and BCCA Treatment Data

Vancouver Island population data were obtained from the BC Stats Web site[6].

The number of new referrals, radiation courses, and chemotherapy visits were obtained from the BCCA's electronic Cancer Agency Information System. The BCCA statistics report covers the relevant April-to-March financial year; however, for ease of display, only the year end is shown.

The BCCA site in Victoria is the sole site for radiation therapy delivery on Vancouver Island. The data for the combined number of radiation courses for external-beam radiation and brachytherapy delivered annually were obtained from the Cancer Agency Information System.

The data for IV chemotherapy visits include all therapies using classical cytotoxic agents and other cancer drugs such as monoclonal antibodies, but not separate visits for supportive measures such as bisphosphonates or blood transfusions.

The number of new courses of chemotherapy commenced at the 2 major BCCA sites for chemotherapy in Victoria and Nanaimo and the total number of all IV chemotherapy visits across the island to those sites and to the community oncology sites was obtained. In this section, each daily visit during a cycle for drug administration is recorded.

The oral data covers the prescriptions processed for oral drugs, including hormonal agents, gonadotropin-releasing hormone agents, corticosteroids, oral cytotoxic drugs, and modern targeted therapies. Those data exclude antiemetics, clinical trial drugs, or expanded access programs from pharmaceutical companies; the results are shown as the total activity for Vancouver Island.

For each parameter, the data are shown both as the total activity and as the activity per 100,000 population.

Statistical Analysis

Incidence rate ratios with 95% confidence intervals were calculated for total new referrals, radiation courses, new IV chemotherapy courses, IV chemotherapy day visits, and the total oral and subcutaneous prescriptions. Results are reported as the percentage change between 2010 and 2015 per 100,000 population (Tables I and II). For each parameter, a 2-sided test of the null hypothesis that the incidence rate ratio is equal to 1 (2015 compared with 2010) was performed. The Stata software application (version 14.1: StataCorp LP, College Station, TX, U.S.A.) was used to calculate confidence intervals and perform hypothesis tests.

RESULTS

Population and Numbers of Referrals

As shown in Table I, the estimated number of residents on Vancouver Island remained relatively static over the 5-year study period. Overall, the population increased to 767,157 in 2015 from 746,058 in 2010, a rise of 2.8% over the 5-year period. The number of cancer patients newly referred to the BCCA in Victoria for assessment during that period rose to 4144 in 2015 from 3520 in 2010, an overall increase of 17.7% for the 5 years. Adjusted for the increasing population, the rate of referral rose by 14.5% in 5 years.

Radiation Therapy

Table I demonstrates the annual number of radiation courses delivered at the BCCA in Victoria. In 2010, 2601 courses were delivered, and in 2015, 2759 courses were delivered, for an overall 6.1% increase over the 5-year period. When adjusted for population growth, the increase was 3.2%, which did not meet the standard for statistical significance.

IV Chemotherapy Activity

The data in Table II demonstrate an increase in the number of new chemotherapy courses started in Victoria and Nanaimo to 1110 in 2015 from 730 in 2010—a rise of 52.1%. Similarly, the total number of IV chemotherapy attendances across the entire Vancouver Island service increased by 62.0%—to 17,070 in 2015 from 10,538 in 2010. When adjusted for population growth, the overall increases in the rates were 47.8% for new courses and 57.5% for total visits. A comparison with earlier figures for 2006–2010 indicates that, in the preceding 4-year period, total chemotherapy courses commenced rose by 10% and overall chemotherapy unit visits rose by 4.4% (data not shown).

Oral Chemotherapy Prescriptions and Pharmacy Workload

Table II presents data concerning the total number of oral cancer treatment prescriptions processed. Overall, the number of prescriptions processed rose to 25,611 in 2015 from a baseline of 20,834 in 2010, for an increase of 22.9%. Alongside that rise in total activity, the complexity of the workload also increased, with 19 new oral cancer agents arriving during the 5-year period, thus reaching a total of 63 in 2015.

DISCUSSION AND CONCLUSIONS

The years since 2005 have seen many improvements in cancer care, particularly the arrival of multiple new cancer-treatment drugs. Although considerable research about the economic impacts of the costs of new drugs has been published, less work has looked at the impact on capacity for pharmacies, drug administration areas, and the wider oncology workforce[4,5,7].

In the oncology community, there is a widely held perception that the number of cancer patients treated—and particularly the number of patient visits for chemotherapy administration—has significantly increased. In the present study, data from a single health care provider population on Vancouver Island in British Columbia allows for an accurate assessment of the changes in cancer referral and treatment activity for the population from 2010 to 2015.

During that period, the population of Vancouver Island increased by 2.8%, and in contrast, the number of new cases

TABLE I Changes in population, cancer agency referrals, and courses of radiation delivered during 2010–2015 on Vancouver Island

Statistic	Year						5-Year increase (%)	2015/2010		*p* Value
	2010	2011	2012	2013	2014	2015		IRR	95% CI	
Vancouver Island population	746,058	749,958	751,809	755,284	759,725	767,157	2.80			
Total new cancer agency referrals	3520	3627	3587	3948	4015	4144	17.70			
Referrals per 100,000 population	471.8	483.7	477.1	522.9	529	540.3	14.50	1.145	1.094 to 1.198	<0.0001
Total radiation therapy courses	2601	2770	2701	2623	2705	2759	6.10			
Radiation courses per 100,000 population	348.7	369.4	359.3	347.3	356.1	359.7	3.20	1.032	0.977 to 1.089	0.2554

IRR = incidence rate ratio; CI = confidence interval.

TABLE II Change in the number of new intravenous (IV) chemotherapy cycles, total IV chemotherapy attendances, and oral chemotherapy prescriptions during 2010–2015 on Vancouver Island

Statistic	Year						5-Year increase (%)	2015/2010		*p* Value
	2010	2011	2012	2013	2014	2015		IRR	95% CI	
Total IV chemotherapy courses started	730	739	838	846	868	1110	52.10			
IV chemotherapy courses per 100,000 population	97.9	98.7	111.4	112.1	114.4	144.7	47.80	1.478	1.346 to 1.626	<0.0001
Total IV chemotherapy day case visits	10,538	11,156	13,526	14,299	15,671	17,070	62.00			
IV chemotherapy day case visits per 100,000 population	1412.6	1487.7	1801.1	1893.9	2064.7	2225.6	57.50	1.575	1.534 to 1.614	<0.0001
Total oral or subcutaneous (SC) prescriptions	20,834	21,863	21,892	23,712	23,551	25,611	22.90			
Oral or SC prescriptions per 100,000 population	2792.5	2915.2	2911.9	3139.5	3099.9	3338.4	19.50	1.195	1.173 to 1.218	<0.0001

IRR = incidence rate ratio; CI = confidence interval.

referred to the BCCA increased by 17.7%. The reasons behind that increase, which is in excess of the population increase, are likely to relate to the increasing incidence of cancer in an aging population[8] and perhaps, more importantly, to the widening indications and age ranges of patients judged to be suitable for cancer treatment.

The overall number of radiation courses delivered during the 5-year period increased modestly, at 6.1%. Other recent studies showed similar results, but have noted the increasing complexity and workload requirements for the radiation treatments delivered[9,10].

Between 2005 and 2014, more than 50 new cancer-treatment drugs were licenced. As a result, the number of lines and the complexity of therapy for many cancer patients has increased, as has the routine use of additional maintenance therapies, particularly with monoclonal antibodies.

The Vancouver Island activity data demonstrate that the overall IV chemotherapy treatment activity increased by 62% over the 5-year study period, which resembles increases reported in other areas. In the United Kingdom, one chemotherapy unit recorded a 67% increase in chemotherapy unit activity between 2004 and 2010[4], and a report from Australia indicated a 10% annual increase in chemotherapy unit activity between 2008 and 2012[5].

The Vancouver Island data also show a substantial increase in prescriptions for oral and subcutaneous cancer therapies. In 2010, a total of 20,834 prescriptions were processed for a pool of 44 different drugs. In 2015, the number of oral and subcutaneous drugs available had increased by 43% to 63, and the total number of pharmacy prescriptions had increased by 22.9% to 25,611.

Those increases in patient numbers and treatment-related activity is already placing considerable strain on health care budgets, oncologists and associated staff, and the facilities needed to support treatment delivery[11]. With an increasing and aging population, the number of cancer patients is expected to rise by 50% over the next 15 years[8,12], and with more than 700 new drugs in clinical development, it is likely that the numbers of drugs and lines of treatment will increase even further[13].

The data presented in this study could be helpful in assessing the resources needed for a further major increase in cancer treatment provision, particularly the capacity for IV drug treatment.

CONFLICT OF INTEREST DISCLOSURES

We have read and understood *Current Oncology*'s policy on disclosing conflicts of interest, and we declare that we have none.

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