

Original Article

A retrospective study on accessibility of palliative radiation therapy in the management of prostate cancer in British Columbia

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Abstract

Timely administration of palliative radiation therapy (PRT) to manage symptoms derived from advanced prostate cancer is necessary to help alleviate discomfort and improve quality of life. Despite PRT being an effective treatment, analyzing utilization rates in British Columbia (BC), Canada for palliative purposes implies it is an under-utilized medical resource. Access to and utilization of radiation therapy (RT) is lower in remote geographical regions and higher in urban regions where a cancer care facility is close in proximity suggesting the presence of geographical barrier affecting access to health care and services. Equitable access to PRT can be achieved by reducing barriers such as geographical distance. This retrospective cohort study describes accessibility of PRT in the management of prostate cancer and the impact of an additional facility on improving access to PRT.

Keywords

Access; radiation therapy; utilization rates; palliation

INTRODUCTION

Theoretically, Canadians enjoy financially unimpeded access to health services irrespective of sex, geography, race, ethnicity, age, illness or disability, life circumstances, or income; however, in practice there are wide variations in access to and use of health services. The circumstances surrounding and reasons for access problems can vary. In some cases access to health services and care may be restricted for capacity and availability reasons; in other situa-

tions, access is restricted due to geographical, financial, physical and social barriers.

Differences in accessing Canadian health services available to residents of rural, remote and northern communities, and large urban centres' are well documented.^{1,2} Decline in health status for rural Canadian communities may be related to their distance away from urban health centres and practitioners alluding to the fact that distance may potentially hinder and/or deter access to available health-care services.³ Results from a pan-Canadian study also suggest residents living in dense population and low migration rate is associated with increased health risks.⁴ Arguably, poor health status in urban areas may

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account for greater uptake of health services preventing residents from rural communities from accessing these health services. However, the health status of urban residents tends to be better than those who live in remote, rural communities.³

Residents living in rural, remote, and northern communities generally have a poorer health status than their urban counterparts. Compared with urban residents, people living in rural communities have a shorter life expectancy and higher death rate which suggests rural residents should be accessing care more frequently. Despite information that connotes disease and illness is common to rural residents, the inability to timely obtain and access health services is an underlying problem.³

The distance in which people living in the rural community must travel to for their health services is a problem expressed by many rural residents.³ Researchers have found distance to health-care providers and facilities is increasing for rural residents¹ and according to another study, more than two-thirds of residents in remote northern regions are living more than 100 km from a physician.^{1,3} The distance required to travel could pose as a deterrent and/or a hurdle for rural Canadian residents to access health services. The discrepancy between the proportions of people living in rural areas, their health needs, and the availability and accessibility of health-care services is evidently substantial.

It can be argued that improved access to health services would improve health and life circumstances and might also lower health and other public costs through delivering appropriate services to those who need them before more expensive and extensive intervention is required. Driven by service demands of the population, there is a need to optimize resource utilization, equitable services for a population, and health-care quality to ensure these needs are met. Quality measurement can inform and provide the basis for improvement in health-care services and project future resource requirements on a population basis. Research tends to measure and gauge whether care is

delivered and to what extent patients are satisfied with the care they receive but provide very little information about the quality of care.^{5,6}

Utilization review can assess and evaluate medical necessity and efficiency of health-care services. More specifically, the information can provide valuable insight regarding the quality, continuity, and accessibility of care. Inferences can be made to determine future requirements in accessing these health-care services. Access to care can be measured in terms availability of the health service to all members of a given population and whether members of the population requiring the service are receiving the service.

Modern management of prostate cancer can include the use of surgery, radiation therapy (RT), hormonal therapy, and/or active surveillance.^{7–12} Prompt administration RT after diagnosis of prostate cancer may improve prognosis and outcome; therefore treatment should not be unreasonably delayed.^{13,14} It is important to note, of those patients who benefit from RT, approximately one half of the prescribed RT is administered for palliative and symptom management purposes to improve quality of life.^{15–17} RT can therefore be used to treat all stages of cancer and plays significant role in disease management.

In relation to RT, access can be measured in terms of utilization of RT itself, specifically the percentage of the population that develops cancer and subsequently receives RT. Utilization rates can measure accessibility, in the context that if rates vary for reasons unrelated to patient condition, then access to treatment is unevenly distributed and barriers may be present. A low RT utilization rate can suggest poor and suboptimal accessibility of the modality and a high RT utilization rate can denote inappropriate use.

Prostate cancer was chosen for this study because of its relative commonness in the male population and also due to the lengthy disease progression which can require multiple

treatment courses before the patient succumbs to the disease. This article examines the accessibility RT with palliative intent in the treatment of prostate cancer in BC, Canada.

SUPPORTING LITERATURE

Valuable information can be elicited comparing actual practice and benchmark values. A benchmark of adequacy of RT treatment provides valuable information for the planning of RT facilities as well as a standard for actual practice. Two studies conducted by Delaney et al.²⁸ and Foroudi et al.²⁹ attempted to develop evidence based benchmarks of appropriate RT utilization rates for prostate cancer.

Delaney et al.²⁸ reviewed practice and treatment guidelines regarding prostate cancer from National Cancer Institute Physician's Data Query (NCI PDQ), National Comprehensive Cancer Network (NCCN), the Royal College of Radiologists/British Association of Urological Surgeons Clinical Oncology Information Network (COIN), and the American Society of Therapeutic Radiation Oncology (ASTRO). Optimal RT utilization trees were constructed to show clinical attributes that indicated possible benefit from RT based on evidence. Australian epidemiologic incidence data (from Australian national and state cancer registries) for each of the clinical attributes were used to calculate the optimal proportion of patients with prostate cancer for whom RT was considered appropriate. This methodology estimated the optimal RT utilization rate for all prostate cancer incident cases to be 60%.

Foroudi et al.²⁹ had a systematic review of literature to identify indications for RT for prostate cancer to ascertain the level of evidence that supported each indication. An epidemiologic approach was then used to estimate the incidence of each indication for RT for a North American population with data from Surveillance, Epidemiology and End Results (SEER) registries and Ontario Cancer Registry using a tree diagram. The study estimated an ideal utilization to be 32% for initial treatment and 29% for later recurrence or progression.

Speculations can be made to explain differences in the estimated utilization rate between the two studies. Differences in estimated utilization rate may potentially be a result of, but not limited to, population characteristics and treatment guidelines in the recommendation of and indication to when (or whether) RT should be used. Discrepancy between optimal benchmark values and actual RT utilization rates may be indicative of shortfalls and quality of care to patient is compromised.

There are indications that palliative RT (PRT) is an under-utilized resource in palliative care even though evidence supports it is an effective treatment.¹⁸ Although it is important to ensure equitable and timely access to care, studies conducted in Ontario and Nova Scotia have demonstrated a variation in the use of PRT unrelated to the needs of the patients.^{19–22} In both Canadian provinces, the use of PRT reduced over a 10-year period, unrelated to the increasing incidence of cancer. Possible reasons for the decline in PRT usage were identified as barriers to accessing RT, including geography, age, waiting times, availability of resources, distance from a cancer centre, socioeconomic factors, patterns of practice among the radiation oncologists, and lack of education regarding PRT among community health-care workers and physicians, resulting in lower referral rates.^{18–22}

Furthermore, Tyldesley et al.²³ found an association between utilization of PRT and the patient's age in Ontario where PRT utilization reduced as the patients' age increased. The decrease in PRT usage was greater than the age-associated decline in functional status seen in the general population with reasons unrelated to patient preference. Physician's judgment about life expectancy, natural history of the patient, and physician biases such as lack of awareness towards efficacy of PRT and unwarranted side effects were alluded as potential reasons for the decline in PRT utilization.²³

An increase in incidence of cancer lead to longer waiting lists for radiation treatment in Ontario in the 1980s.²² This precipitated in a

Table 1. Outline of 4 HAs and 16 HSDAs

Health authority	Health service delivery areas	Geography	Cancer centre present
Northern	Northwest Northern Interior Northeast	Large rural and remote area	None
Interior	East Kootenay Kootenay Boundary Okanagan Thompson Cariboo	Large rural and small urban area	Yes
Vancouver Coastal	Richmond Vancouver North Vancouver/Coast Garibaldi	Mainly urban and suburban, small rural area	Yes
Vancouver Island	South Vancouver Island Central Vancouver Island North Vancouver Island	Mainly urban and suburban, small rural area	Yes
Fraser	Fraser Valley Simon Fraser South Fraser	Mix of suburban and rural areas within ~100 km of large urban area	Yes

MATERIALS AND METHODS

Prostate cancer incidence and RT data were extracted from the BC Cancer Registry and the BC Cancer Agency Information System (CAIS). The BC Cancer Registry is a population-based registry that holds information on all cancers diagnosed for BC residents. The Cancer Registry is integrated into CAIS which holds all clinical data on patients referred to the BCCA including detailed RT information such as dose fractionation regimens and treatment intent. In addition, death information such as date and cause of death from vital statistics is linked to the Cancer Registry/CAIS thus providing an integrated database holding incidence, treatment and mortality data.

For this retrospective cohort study, all invasive prostate cancer cases diagnosed between 1 January 1986 and 31 December 1999 were extracted from this integrated database. All RT treatment from 1 January 1986 to 30 April 2005 relating to these cases was also extracted to ensure adequate time for follow up and potential disease progression that might require RT. A second subset of data was extracted which included all deaths from prostate cancer between 1 January 1990 to 31 December 2005 and all RT treatment between 1 January 1986 and 31 December 2005 relating to this cohort of cases. Cases classified as benign, borderline or *in situ* disease was not extracted.

FINDINGS/RESULTS

Access to treatment can be measured in terms of utilization of RT itself, specifically the percentage of the population that develops cancer and subsequently receives RT. If utilization rates are observed to be low for reasons unrelated to patient condition, then it suggests access is inadequate and unevenly distributed. It is also possible to observe higher utilization rates which may imply inefficient use. Both under- and over-utilization of RT can allude to a suboptimal or inappropriate use of the modality.

The following metrics were used to measure the utilization of services provided in BC:

- *Overall RT utilization rate (RTUR)*: The percentage of prostate cancer cases receiving at least one course of RT at any point after diagnosis.
- *PRT utilization rate (PUR)*: The percentage of prostate cancer cases receiving at least one course of RT with palliative intent at any point after diagnosis.
- *Referred RT utilization rate*: The percentage of prostate cancer cases that were referred to BCCA receiving at least one course of RT at any point after diagnosis.

- *Multiple course rate (MCR)*: The percentage of prostate cancer cases receiving more than one course of PRT.

Cumulative probability of receiving PRT was obtained from Kaplan–Meier survival analysis with cases censored at time of death. Incidence rate is age-standardized to BC 1991 population.

Overall, approximately 40% of all prostate cancer incident cases (Figure 2) received some form of radiation treatment when diagnosed during our period of study. Of these, less than 14% were treated with palliative intent. The PUR declined over time from approximately 14% for patients diagnosed between 1986 and 1988 to approximately 6% for individuals diagnosed between 1998 and 1999 (Figure 3). The age at which patients received their first PRT increased from a median of 70 years old in 1986 to 74 in 1999 (Figure 4). The age at which the patient is diagnosed may influence how soon they receive PRT. Of those who received PRT in BC, the data extracted suggests the older the patient is at time of diagnosis, the sooner they would receive PRT (Figure 5). Overall, 24% of patients received PRT within a year of them being diagnosed and 91% of

patients received PRT within 10 years after their initial diagnosis. The referred RT utilization rate for patients diagnosed between 1986 and 1994 maintained a steady increase from 80 to 90%. However, for patients diagnosed since 1994, a decline of over 15% was seen (Figure 6).

RT utilization rates were observed to vary with geography. In our previous study, referral rates for PRT were found to be higher in the more urban HSDAs such as Vancouver, Richmond, South Vancouver Island, and Central Vancouver Island, and lower in rural areas such as East Kootenays and Northeast.¹⁴ Overall, PUR was highest in urban Fraser HA (27%), Vancouver Coastal HA (24%), Vancouver Island HA (22%), with the lowest in the rural Northern HA (4%) (Figure 7). Interior HA PUR is slightly above 20%, excluding East Kootenay. East Kootenay and the Northeast HSDAs are located near the border of the Canadian province Alberta. Patients from these two HSDA are often referred to cancer centres in Alberta for treatment due to proximity and ease of accessibility therefore differences in PUR can partially be explained by patients referred to cancer centres in Edmonton or Calgary. As a result, data for East Kootenay and Northeast HSDAs were excluded.

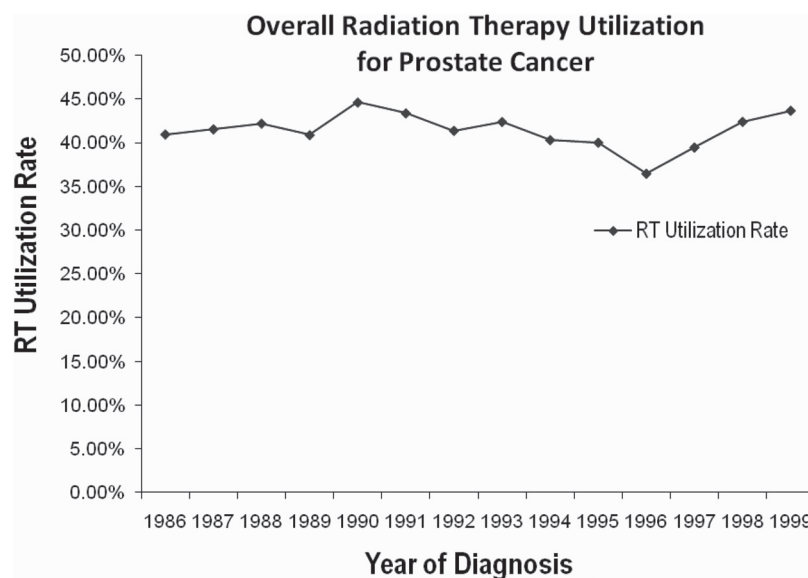


Figure 2. Overall radiation therapy utilization for prostate cancer. Approximately 40% of prostate incident cases received RT from 1986–1999.

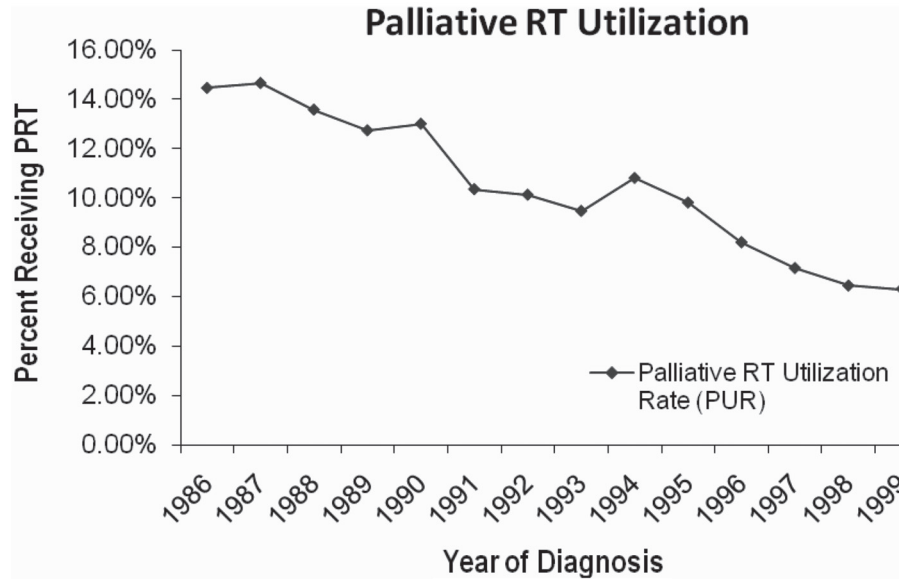


Figure 3. Palliative RT utilization (PUR). The use of PRT declined from 1986 to 1999.

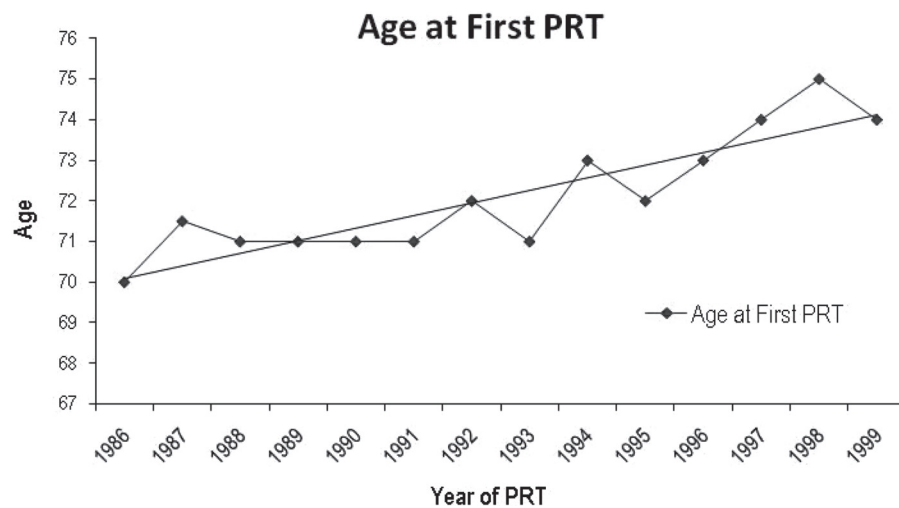


Figure 4. Age at First PRT. The first PRT is administered later in age.

The highest PRT utilization rate was in Richmond HSDA with PUR of 14% (Figure 8) and MCR of 52% (Figure 9) indicating more than half of the patients in Richmond who received one course of treatment received subsequent courses of palliative treatment. The MCR is consistently near 50% for most urban HSDAs (Figure 9) meaning those who have been referred into BC Cancer Agency are monitored continuously and the practice to administered PRT is consistent throughout

the province. This is not surprising because patients' would normally receive secondary treatments in the same institute where they received their initial treatment. Exception exists for the Northern community with less than 40% MCR in PRT utilization which may possibly be due to the community being largely rural and remote from cancer facility (Figure 9). Reasons for this should be explored further. The lowest PUR and MCR for an urban HSDA was North Vancouver Island.

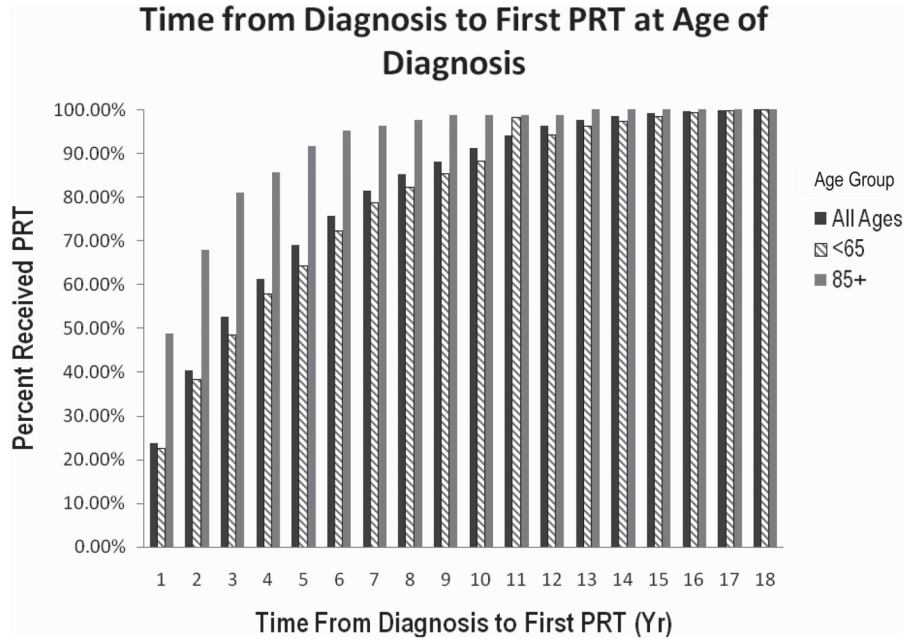


Figure 5. Percent of patients who received PRT by age at diagnosis. The older the individual at diagnosis, the sooner they received palliative RT.

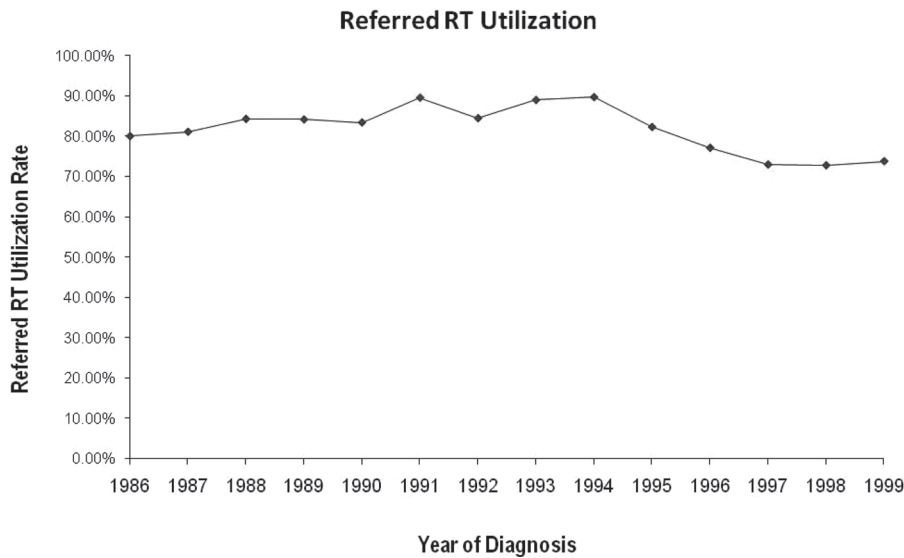


Figure 6. Referred RT utilization rate (RTUR). RTUR declined after 1994 by approximately 15%.

DISCUSSION/IMPLICATIONS

The *Canada Health Act* is Canada’s federal legislation for publicly funded health-care insurance which states “to protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other bar-

riers.” One of the five criteria for the Act is accessibility, which intends that persons in a province or territory have reasonable access to hospital medical, and surgical-dental services on uniform terms and conditions.²⁵

Demographics of prostate cancer have changed over our period of study in BC, with

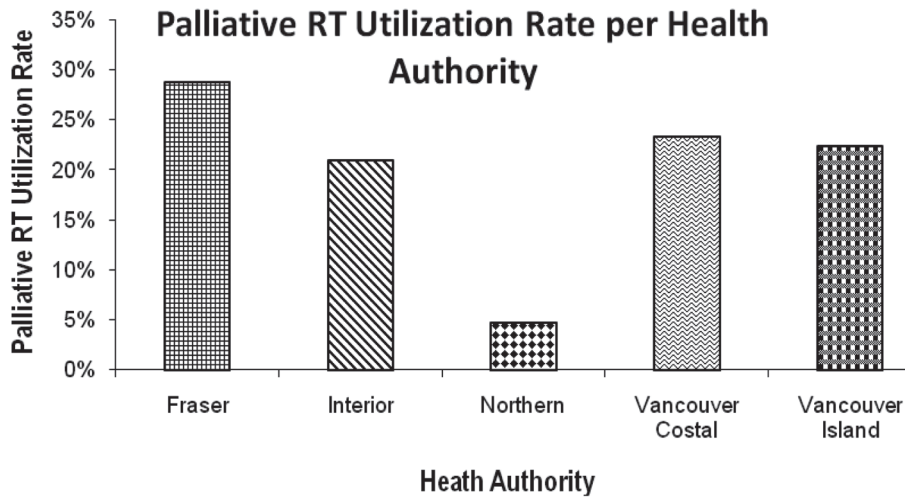


Figure 7. Palliative RT utilization per health authority. Note how PUR varies geographically between urban and rural HAs.

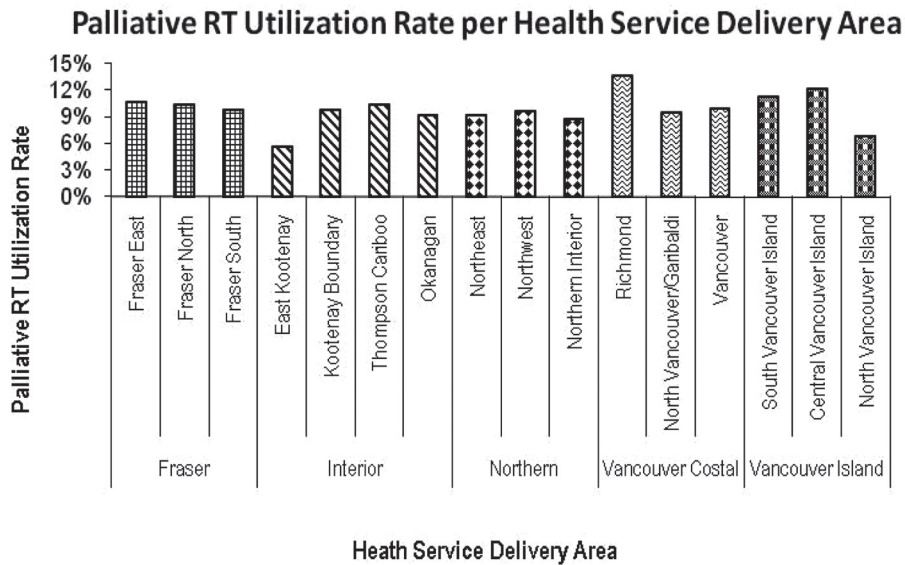


Figure 8. Palliative RT utilization rate per health service delivery area. Note how there are geographical variations in PRT utilization amongst urban and rural HSDAs and HSDAs within the same HA.

patients being diagnosed at an earlier age, treatment is received at an increased age, and death resulting from prostate cancer is occurring at a later age Figure 10. Not surprisingly, the data extracted suggests the older the patient is at the time of diagnosis, the sooner they would receive PRT, as one would expect. The referred RT utilization rate for patients diagnosed between 1986 and 1994 maintained a steady increase from 80% to 90%. However, for patients diagnosed since 1994, a decline of

over 15% was noted in RT utilization. Reasons for this should be explored further.

The utilization rate for all RT remained constant over time at 40%, slightly more than the rate suggested by Foroudi et al.²⁹ at 32% for initial treatment, less than the rate suggested by Delaney et al.²⁸ at 60%, but consistent with rates reported in Ontario by Tyldesley et al.²³ Foroudi et al.²⁹ also suggested 29% for later recurrence or progression, yet BC only

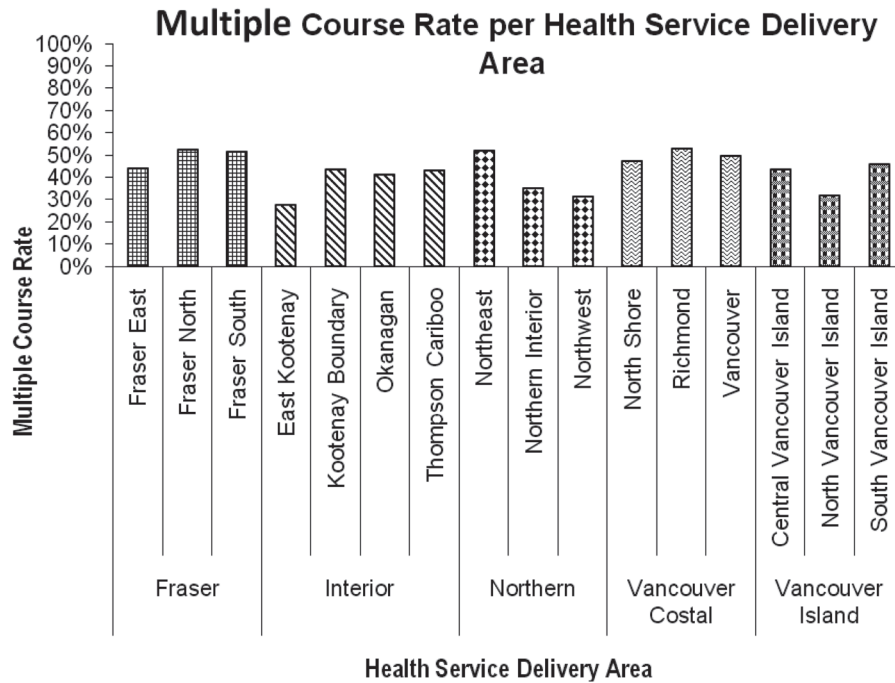


Figure 9. Multiple course rate per HSDA. Note how there are geographical variations in cases receiving multiple courses of PRT between rural and urban HSDAs.

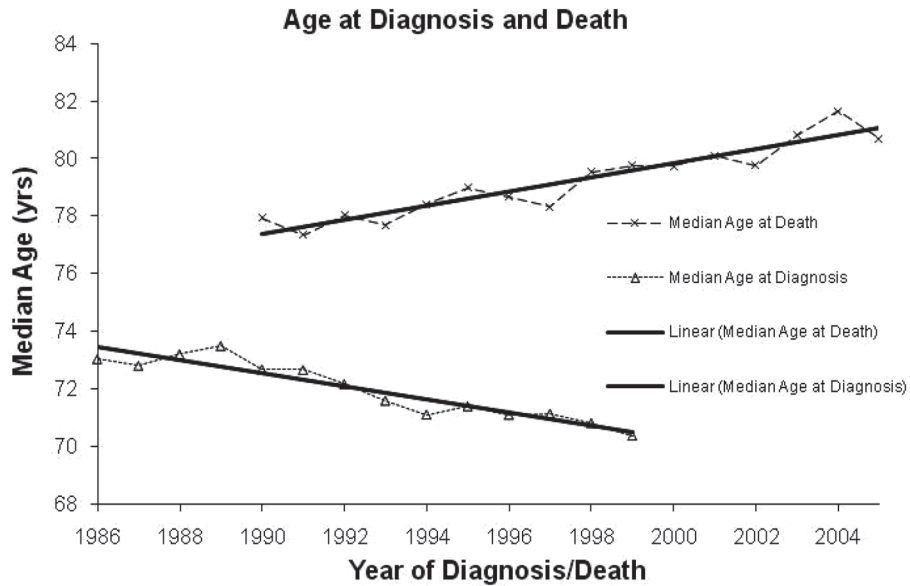


Figure 10. Age at diagnosis and death. The age at diagnosis is occurring earlier and the age at death is occurring later.

achieved a PRT utilization rate of less than 14%. With the availability of alternative management options such as hormone therapy and the possibility of treatment refusal due to age or disease progression, it may be possible that men diagnosed with prostate cancer may decide

against receiving PRT, and therefore potentially causing a decline in overall PRT utilization.

Similar to the data reported from Ontario, the PUR and MCR for prostate cancer in BC varies with the geography. Areas with a higher

PUR in BC are considered geographically urban and locations with a lower PRT utilization are considered geographically rural. As a result, accessibility of PRT between rural and urban areas is evidently geographically dependent. Regions that were more geographically remote such as Northern BC had a lower PRT utilization.

Furthermore, those who reside in areas geographically removed from a cancer centre were less likely to receive PRT. This is nicely illustrated on the Vancouver Island. PUR and MCR were observed to be lower in the North Island as compared with the South Island, where a cancer centre is situated. Likewise, those who reside in more remote areas were less likely to receive subsequent course of treatments than those who reside closer to a cancer centre. The MCR was lower in remote rural areas such as the Northern area and the East Kootenays, but unlikely to be related to migration of patients to Alberta, because patients normally receive secondary treatments in the same institute where they received their initial treatment.

If utilization rates are observed to be low for reasons unrelated to patient condition, then it suggests access is inadequate and unevenly distributed. It is also possible to observe higher utilization rates which may imply inefficient use, which is not seen in our study. The data from our study suggests accessibility to radiation treatment is variable and dependent on geography and distance to a cancer care facility. The inability to drive and lack of transportation have been speculated as possible reasons for geographical differences in PRT utilization and PUR. However, travel assistance is readily available for patients receiving treatment at BCCA to minimize barriers in accessing cancer treatment. There are local volunteer driving programs that support each of the five BCCA cancer centres. The use of the volunteer driving programs is free of charge and is offered to all BCCA patients, regardless of age, education background, gender, socioeconomic status, or occupation, to travel to and from BCCA clinics therefore, even patients who do not possess a driver's license would still be able to travel to a cancer centre to receive treatment.

It is not clear from our data whether the rural regions are underserved or not; however, this information alludes to the possibility of reduced quality of care and inequality in care. According to Health Canada, quality care is the accessibility and delivery of care to increase the likelihood of achieving the best possible health outcome for Canadians²⁶ which for our study purpose is the accessibility and administration of PRT. The data from our study suggests accessibility to PRT treatment is variable and delivery of PRT is not consistent throughout the province hence the quality and extent of care is unequal.

Accessibility of PRT is dependent on geography and distance to a cancer care facility. Lower PRT utilization was observed for geographically remote regions and higher PRT utilization for those who live close in proximity to a cancer facility suggesting there is an advantage to those living close to the resource. If quality care is about accessibility and delivery of care to achieve the best possible health outcome for patients, then regions that are geographically remote and residents who do not live in close proximity to a cancer care facility suffer from low quality and unequal care. The potential outcome of inconsistencies across the province and reduced access to treatment due to geography is patients' not being able to receive PRT when needed hence their health outcome and quality of life is potentially compromised.

Because BCCA can only provide treatment to those who are referred, the referral system acts as the key to accessing treatment. Problems with access may be related to the referral process itself. Difference in PRT utilization may be due to a lack of referrals by physicians into the BCCA system. On the other hand, this may be an indication of a different referral pattern existing in regions where a cancer centre is not easily accessible. It may be that the referral process in these areas effectively screens out patients who do not require PRT, but it could be regarded as under-utilization from remote areas. This area is currently being investigated.

Being a retrospective study, reasons can only be postulated behind under-utilization of PRT

in BC. Although the economy may contribute to provincial differences in resource availability and accessibility, it is not within the scope of this paper for discussion. One of the criticisms of this study is that the incident data set is from 1986 to 1999 and the treatment data is from 1986 to 2005. However, knowing the disease progression can be lengthy, the additional time allows for proper follow up and any PRT required for the patient diagnosed in later years.

BCCA will need to ensure strategic placement of treatment centres to ensure accessibility of RT treatment for those who require it without barrier. Adding additional resource such as a cancer centre in Interior, BC in 1998 led to an increase of utilization of RT in those HSDAs, supporting the strategic direction that building cancer treatment resources closer to area of demand can lead to increased accessibility and more equitable access to care.¹⁴ All three measures used assess to care denotes PRT utilization is unevenly distributed, rural patients are underserved and perhaps suffer from reduced quality care in relation to urban areas, and patients who reside close in proximity to a cancer centre are more likely to access PRT.

These differences represent an imbalance in access that may impact patient outcomes. The cancer incidence in Northern part of BC is slightly lower than the provincial average for BC, yet has a higher hazard rate of cancer death that is 13% more than the provincial average and significantly higher than all other HAs.²¹ One would not expect that an area with a higher level of mortality from cancer would experience less referrals and less palliative treatment than other areas, yet such is the case and implications to inconsistency in care quality is implied. Although it may be argued that BC is under-serving its population, it is possible that the utilization rate estimated by Delaney et al.²⁸ and Foroudi et al.²⁹ may be too high, or that the ideal rate lies somewhere in between.

For resource planning and improvement purposes it would be desirable to achieve a high

utilization rate for all areas of BC. This information is beneficial partly because it can be used to predict future RT workload. It would also seem that two elements are required to ensure adequate access to RT with palliative intent. The first is that referrals to BCCA are made and second, the resources are in place to accommodate an increase in referrals and subsequent treatments such as PRT. To ensure equitable access across the province and to meet the workload demands, this in part can be addressed by ensuring proper physical and financial resources are available where population warrants. Adding additional treatment capacity, as demonstrated by building a full service cancer centre in Southern Interior, BC in 1998, proved beneficial.

To provide equitable service and optimal resource utilization, plans are in place to build a cancer centre in Northern BC by 2012. This should help improve access to radiation treatment in the Northern region. Additional education of community and local physicians would likely to benefit with focus on increasing awareness of RT services and knowledge on the use of RT. Physicians will be more knowledgeable of the referral process so referrals to BCCA can be made.

Using measures of access is useful in establishing targets and identifying where shortfalls in RT are. It can help direct quality improvement programs to the areas of most gain to achieve the set targets. In the province of Ontario, a study by Samant identified local family physicians were unaware of the benefits of PRT.²⁷ Both BC Cancer Agency and northern HA have been working together in developing a cancer strategy aimed at addressing inequities in accessing cancer care. This includes constructing an additional cancer centre, with full RT facilities, in 2012. It is hoped that this will address some of the issues related to access in remote areas.

CONCLUSION

In conclusion, accessibility of PRT in the management of prostate cancer varied across

different geographical areas in which people reside. Access to and utilization of RT was lower in remote geographical regions and higher in urban regions where a cancer care facility is close in proximity suggesting there may be a slight advantage to living closer to the resource. Variability in PRT usage suggests the presence of geographical barrier affects access to health care and services and that equitable access to PRT can be achieved by reducing barriers such as geographical distance. The information gathered in this study provides information for planning RT services on a population basis to ensure no community in BC is unequally served. Future work is encouraged to identify where shortfalls in accessing RT are so that it can help direct quality improvement programs to the areas of most gain.

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