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ICES Institute for Clinical Evaluative Sciences

Waiting Lists for Radiation Therapy in Ontario

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ABSTRACT

Background

Waiting times for radiation therapy in Ontario have caused concern among patients and care providers in recent years, and a number of initiatives have been undertaken to shorten waiting times. At the request of the Ontario Ministry of Health and Long-Term Care, the Institute for Clinical Evaluative Sciences carried out a program of consultation and research on the state of waiting times for radiation therapy and ways to monitor them. The project team conducted literature reviews, evaluated and analysed administrative data documenting treatment and waiting times, and consulted with stakeholders.

Observations

Valid data on current waiting times is essential to show if efforts to expand treatment capacity and shorten waiting times are working. Data systems in place at the time of this study, however, were not up to the task of monitoring meaningful waiting times for radiation therapy well, or at least not across all patient groups and all centres. Key elements were missing from each data system. Data collected and definitions used were also variable, including basic information, such as how individual cases or episodes of care are documented.

Although there are caveats to interpreting these data, they do appear to confirm that waiting times for radiation therapy (especially for adjuvant breast cancer treatment) were longer than recommended in Ontario in 1999 and 2000. It remains to be seen if these data can be used effectively with future systems to document change. There was consensus that delays also exist in delivery of radiation therapy to prostate cancer patients although available data are very limited with respect to documenting this.

Data also indicated that breast cancer patients receiving adjuvant therapy (therapy following surgery) tended to wait longer than patient groups receiving radiation as the primary way to treat their cancer or who were most likely to experience devastating effect from waiting. These trends are interpreted as showing that existing hospital policies favour relatively quicker treatment of patients whose need is arguably more urgent. It was clear through consultation processes that mechanisms exist at all centres to expedite care for urgent patients, and that these policies do have an effect to reduce suffering.

A review of the literature and expert opinion show that there are differences in urgency among cancer patients depending on the nature of the diagnosis, the purpose for which radiation therapy is used and intended treatment outcomes. However, there are very few data to show precisely how much harm is associated with additional waiting times, and it is difficult to pinpoint how long is too long. Limiting waiting time for all cancer patients is an important goal.

Recent Developments

During the course of this project and in the months that followed, a number of new initiatives were announced by MOHLTC, Cancer Care Ontario and Princess Margaret which addressed the issues discussed in this report. Early in the project, treatment of breast cancer patients began at an after-hours clinic established in the Toronto region. In the latter half of 2002, the MOHLTC announced

significantly increased funding for cancer services, including funds earmarked for enhanced data systems and improved management of referral and waiting times for key oncology services. In November 2002, Cancer Care Ontario reported that implementation of the enhanced information management systems would include, as a high priority, the establishment of a province-wide system to manage referral of all patients to radiation therapy, including reporting of waiting times and consideration of relative urgency. The Cancer Quality Council of Ontario was also established to oversee cancer services and monitor progress made toward goals which include adjustment of waiting times for care to more reasonable lengths.

Recommendations

All centres delivering radiation therapy should begin reporting meaningful and comparable data on waiting times and begin doing this as soon as enhanced data systems can be implemented. This will require new human resources and a commitment to reporting as much as new technology. This project is not alone in making these recommendations.[1-3]

1. INTRODUCTION

Waiting times for radiation therapy in Ontario have increased markedly in recent years.[4;5] This is recognized by care providers, patients and the Ministry of Health and Long-Term Care (MOHLTC) and has been the focus of several efforts to address the problem. Past and present efforts to shorten waiting times have included workforce task forces, redirection of Ontario patients to treatment facilities out of region and out of province and extension of hours of care.[3;6-12] However, there is little hard data in the public domain to show how long waiting times have been or to monitor changes in typical waiting times.[1-3;5;11] Such data is important to evaluate whether system and policy changes can alleviate long waits, and to assess the difference in waiting times observed with structural and policy changes. Recent changes in the delivery of radiation therapy have included temporary re-referral of patients to the United States and the opening of an after-hours clinic in Ontario operating as a private corporation.

At the request of MOHLTC, the Institute for Clinical Evaluative Sciences (ICES) undertook a program of consultation and research to provide a series of literature reviews and statistical analyses of waiting times in Ontario using recent data. ICES was asked to obtain and analyse existing data to determine the extent of the problem, to make an evidence-based recommendation regarding target timelines for delivery of radiation therapy, and to consider measures that might be undertaken to establish a waiting times reporting system. This document provides a summary of the objectives, observations and resulting recommendations of this project.

This report includes the following:

- An overview of the tasks, objectives and methods.
- A summary of results and conclusions from literature reviews.
- A summary of conclusions from data analysis and related activities.
- An overview of the processes of consultation and project meetings.
- A summary of conclusions and recommendations.

2. PROJECT OVERVIEW

2.1 GOALS

The project team and numerous collaborators completed the following major activities:

- Consultation with stakeholders in radiation oncology, including management, care providers and patients.
- Literature reviews.
- Quantitative analysis of actual time intervals to the start of radiation therapy for Ontario cancer patients, and factors associated with relatively long or short delays.

2.2 PARTICIPANTS

Members of the ICES team included research faculty with expertise in radiation and medical oncology, epidemiology and health care services research. ICES staff provided additional expertise in research coordination, library and literature searches and critical appraisal of scientific research, as well as programming and biostatistical support.

To advise the ICES team, a Stakeholder Group was established representing Cancer Care Ontario (CCO), Princess Margaret Hospital (PMH), various professional groups in oncology care and cancer survivors. Stakeholders were informed of the goals of the project and given opportunities to review research plans and advance copies of draft reports and to comment on reports and recommendations. Within this group of stakeholders, a smaller Working Group was convened. The Working Group included those who volunteered to meet more frequently with the project team as the work progressed. Project participants are identified in Table 1 (page 20).

The consultation project had representation from the following agencies:

- Institute for Clinical Evaluative Sciences
- Cancer Care Ontario and the eight regional cancer centres
- Princess Margaret Hospital of the University Health Network
- Ontario Ministry of Health and Long-Term Care
- Canadian Association of Radiation Oncologists
- Ontario Medical Association, Radiation Oncology Section
- Radiation oncology therapists
- Physicists in radiation oncology
- Radiation Oncology Research Unit at Queen's University
- Canadian Cancer Society
- Cancer survivors (lay participants)

2.3 CONSULTATION

The Stakeholder Group met twice, at the outset and at the conclusion of the project, with two Working Group meetings in between. In addition, the project team had regular discussions with clinical and management staff of CCO and PMH regarding policies and procedures of patient registration, referral and clinical data collection. Team members also met with Information Systems staff of CCO and the Department of Radiation Oncology at PMH regarding the collection, processing and interpretation of electronic records for patient data and data on clinical activities. These discussions were summarized at meetings of the working and stakeholder groups.

2.4 TIMELINES

The Ministry of Health and Long-Term Care approved the project on November 20, 2000, and Sunnybrook and Women's College Health Sciences Centre completed its ethical review on December 4, 2000. In all, it took ten months from the first request for all data to arrive at ICES. Reasons for delay were multifactorial. Several months were needed to address privacy concerns and data sharing under existing legislation. There were also delays in processing data at CCO and PMH, where staff are not ordinarily responsible for releasing data to outside researchers. The project also coincided with a heavy workload arising from the Cancer Services Restructuring Committee[3] and other processes (see also section 7 below).

As a result of these delays and other considerations, the project team did not conduct the extensive chart abstraction originally proposed. Instead, a project with very similar goals is being undertaken with funding from the National Cancer Institute of Canada (NCIC). Dr. Veronique Benk is the principal investigator for that project.

3. LITERATURE REVIEW

This section provides a brief overview of the literature reviews undertaken as a component of this project. Detailed reviews are included in Appendix A.

3.1 OBJECTIVES

At the outset of the project, the following goals of the literature reviews were established:

- To identify evidence-based practice guidelines in Ontario and elsewhere that have set time limits on the start of radiation therapy, and to review the evidence upon which such recommendations were made.
- To complete a systematic review of published studies relating the time to the start of adjuvant therapy (radiation therapy following surgery) to disease-related outcomes, including disease progression and survival time.
- To review, more briefly, the basic science of cancer progression radiation therapy in relation to the harm caused by delays, as well as the psycho-social impacts of delayed or protracted cancer treatment.
- To comment on the overall quality and limitations of evidence suggesting upper time limits on the start of primary and adjuvant radiation therapy.

3.2 METHODOLOGY

3.2.1 Structured review of the impact of delayed start of radiation therapy on outcomes

A systematic overview was completed on the subject of the impact of delayed radiation therapy on disease outcomes. The review considered published experimental or observational studies in selected cancer sites: female breast, lung, prostate, head and neck (tonsils, nasopharynx and larynx), uterine cervix and endometrium, and rectum. Relevant citations were identified through very broad key- and text-word searches of major health and medical bibliographic databases for publications appearing between 1997 and 2000 inclusive, supplemented with back-referencing, author searches and recommendations of stakeholder group members. Retained articles all had English abstracts but included publications in several languages. Reports by public and non-government organizations were also searched for relevant studies. In total, the search process yielded 1,579 relevant abstracts. A final selection of 543 relevant research reports were critically reviewed by the ICES faculty involved in the project.

3.2.2. Informal literature reviews

Two other areas for literature review were identified at the outset, but these were not completed using the systematic approach described above. The first was a review of general principles in tumour biology to determine what evidence existed to indicate whether some tumour types or indications for radiation therapy were associated with greater or lesser urgency. A total of 15

textbooks of medicine, oncology and radiation oncology and approximately 20 review articles on the biology of radiation therapy were reviewed. The goal was to determine if there existed a general system to define relative urgency for radiation therapy.

The original project proposal included a review of the impact of delayed radiation therapy on the psychological and social well being of the patient. However, all parties felt that waiting for radiation therapy caused anxiety and stress for patients and caregivers alike, and that there was no need to further document this. Furthermore, a report appeared during the project, using qualitative research methods, that clearly identified the effect that waiting had on patients and caregivers at PMH.[13]

3.3 FINDINGS

3.3.1 Review of studies on the impact of delayed radiation therapy

In breast cancer, one prospective study and several retrospective studies (all non-randomized) were found which compared patient outcomes in patients starting radiation therapy at various intervals after surgery.[14-19] Three of six reports found delays of up to 50 days to increase risk of local recurrence in patients receiving post-surgical radiation therapy without chemotherapy. In patients receiving both adjuvant chemotherapy and radiation therapy, four of seven reports found delays of greater than 180 days to be associated with increased risk of local recurrence.

In the prostate cancer literature, one study addressed the impact of waiting for radiation therapy after radical prostatectomy and found no difference in outcomes. Two retrospective studies looked at the impact of later versus earlier radiation therapy without radical prostatectomy and found a relationship between delay and shorter survival time. However, these studies predated PSA testing and may not be relevant to current practices.

In head and neck cancers, eight observational studies were found [16;17;20-25] reporting that patients receiving radiation therapy relatively later had worse outcomes, while three studies [26-28] found no effect.

No studies were found which addressed directly the timeliness of starting radiation therapy in relation to patient outcomes for lung, rectal cancer or the gynaecologic cancers. No clinical trials or observational studies were identified which specifically contrasted prompt versus relatively delayed use of radiation therapy for acute palliative purposes. In all disease-site groups, many articles referring to 'delayed radiation therapy' in titles and abstracts really addressed interruptions in care or contrasted different schedules of delivering radiation therapy.

In summary:

- For several of the disease-sites there were no relevant studies assessing the impact of delayed radiation therapy on the patient. While a few relevant studies were found for prostate cancer, little definitive evidence was presented.
- For breast cancer, there were a number of relevant studies, but there was a mix of positive and negative findings.
- Head and neck cancer was the area with the largest number of positive studies (i.e., giving evidence of a negative impact of relatively later radiation therapy). The study designs do not permit identification of a critical time period beyond which the outcomes of care would likely be compromised.

3.3.2 Observations about the extent and nature of the scientific data

The project team presented several caveats to using the identified studies to set appropriate maximum waiting times for policy or practice guidelines. First, studies in this area are all non-randomized. No clinical trials were found comparing timely versus delayed radiation therapy – it would be unethical to randomize patients to timely versus delayed care. A number of factors could operate to either exaggerate or dampen the observed impact of delayed radiation therapy, regardless of the true biological effect. For example, patients in a clinical trial who do not receive radiation therapy as per the planned protocol may have been less well to begin with or may have received incomplete treatment (which could be confused with a negative effect of waiting). Similarly, patients at higher risk of recurrence or progression could receive care more quickly, making it more difficult to detect a true negative effect associated with waiting longer.

This field of literature is unlikely to pinpoint with precision maximum waiting times associated with no adverse impact. First, for many patients there may be a continuous relationship between waiting and increased risk of adverse effects, rather than a distinct moment that is 'too late'. Second, it is generally difficult to define dose-response relationships such as this, and to detect thresholds at which risk starts to increase. This kind of study requires very large numbers of patients and considerable clinical information to control for other factors.

3.3.3 International guidelines on maximum waiting times

A great number of international clinical practice guidelines provided evidence of benefit of radiation therapy in many cancer sites; however, very few made explicit statements about the timing or timeliness of treatment [I] (identified in Table 2). In total, several of the UK guidelines did comment on recommended time to RT [II], although the level of evidence cited was consensus or expert opinion, rather than solid experimental data. One Canadian practice guideline for adjuvant radiation therapy in breast cancer was updated in early 2002 to include a statement that starting therapy within 12 weeks cannot be proven in scientific data, but is 'reasonable'. In summary, groups charged with developing evidence-based practice guidelines have not found Level A evidence for specific recommendations, but some of the groups have felt that recommendations on upper limits are justifiable based on consensus alone.

3.3.4 Tumour biology and urgency of radiation therapy for different patients

The informal review in this area identified no single formula or system to quantify the urgency of radiation therapy across all patient groups. However, there was ample evidence to show that some degree of prioritization is justifiable. Several considerations were identified that might lead to relatively higher urgency ratings for a patient. Urgent cases would be those patients in immediate risk of catastrophic events (e.g., to avoid spinal cord compression or fracture, or to stop bleeding). Radiation therapy might also be considered more urgent in some patient groups where it is used as a primary form of treatment aimed at the primary tumour mass, or where the effect of radiation therapy on reducing the risk of local or regional recurrence will have the greatest impact on patient survival.

In the absence of a simple schema to assign urgency, this is best assigned by clinical experts with knowledge of the particular circumstances of the patient.

3.4 RECOMMENDATIONS

1) For the foreseeable future, maximum allowable waiting times for radiation therapy must be set from expert opinion and consensus, rather than empirical data. The literature reviews provided no strong grounds to lengthen or shorten maximum waiting times suggested by CARO[29] or in other countries.

    a) Studies in the near future likely will not provide overwhelming evidence of maximum allowable waiting times. Further research should be done, particularly prospective studies that obtain important control information and examine why radiation therapy is delayed.

    b) For many disease sites, the increase in risk over time may be more or less linear (e.g., risk may increase steadily with each week as opposed to sharply at one point in time). Choosing the maximum acceptable waiting time then implies making an equally arbitrary decision about what percentage risk (on a continuum) is acceptable to society.

    c) For disease types where biological arguments for maximum time limits can be made (such as to avoid cell repopulation during weeks following another form of therapy), this may be given greater weight than non-randomized study data.

2) Where access to care is limited, it is appropriate to treat patients according to urgency, as long as all patients who would benefit do in fact receive the necessary care. There is ample precedent for this within and outside Ontario.

3) Where there is evidence that a patient is likely to benefit from radiation therapy, compassion alone is a sufficient reason to keep waiting times to within a few weeks of the patient being physiologically ready for treatment.

4. ANALYSIS OF DATA

This section provides an abbreviated review of the analysis of radiation oncology clinical activity data. Detailed analyses are attached as Appendix B.

4.1 GOALS AND RATIONALE

The goals of this part of the project were:

- To examine available data critically in order to determine if data can be used to track waiting times for radiation therapy in a way that is consistent with other 'waiting times' or queue management systems in Canada and abroad;
- To estimate actual times from the start of radiation therapy management to the start of treatment for important groups of cancer patients;
- To demonstrate variability in typical time to treatment periods for different patient groups (including palliative versus non-palliative care patients and regional differences);
- To address some of the known problems with data available to the specialized cancer hospitals, including incomplete data on chemotherapy; and
- To serve as a demonstration of what it is feasible to report regarding waiting times, and to serve as a pilot study and model for reporting by individual cancer centres in the future.

Long before this consultation process, PMH and CCO staff used and reported data about observed waiting times and numbers of patients waiting. Such data were used for internal management activities and reporting to MOHLTC. The advantages of bringing the data from CCO and PMH together at ICES were as follows:

- The analytic team could try to derive the same indicators for both institutions. One stated goal was to determine how comparable the data collected were across the two centres.
- Data from radiation oncology units could be supplemented with external data on surgery and chemotherapy.
- The research team could present estimated 'waiting times' by disease site groups as well as for palliative and non-palliative therapy separately.
- To a limited extent, this allowed validation by independent analysts of indicators and measures (such as key dates) that had been derived by centre staff.

4.2 METHODOLOGY

4.2.1 Data sources

Clinical activity data from CCO, PMH and all Ontario regional cancer centres were combined with MOHLTC data used at ICES for research purposes. CCO and PMH were asked to provide complete and anonymous electronic records for all patients receiving radiation therapy at any time during

calendar years 1999 and 2000, including Ontario Health Insurance Number (OHIN), type of cancer (diagnosis) and the dates of clinical activity.

Chemotherapy data (start and end dates of treatment) were taken from records of physicians' billings to OHIP for administering IV chemotherapy. Billing records were matched to the patients in the CCO and PMH data by encrypted OHIN and the appropriate date range. Chemotherapy data did not include oral chemotherapy drugs commonly used in cancer, such as tamoxifen for breast cancer and hormonal drugs for prostate cancer. For selected diagnoses, surgical records were used from the Canadian Institute for Health Information.

A comparative summary of the data elements obtained or derived for the two sources appears in Table 3 on page 27.

4.2.2 Patient selection

Not all patients treated in 1999 and 2000 were included in this analysis nor were all patients referred for treatment in this period. Instead, a special subset of all patients (from both CCO and PMH) was created to come as close as possible to a group of new patients that would be comparable across the two institutions. Newly treated patients, for the purposes of this analysis, were defined as those starting radiation therapy for the first time for any type of cancer and who progressed all the way from referral to the start of radiation therapy treatment within the time period of the available data.

Patients from either source were included if:

- They received radiation therapy treatment at any point in 1999 and 2000 (excluding those assessed for RT, but not treated; and those still waiting at the end of the study);
- *And* they were a 'new patient' to the cancer centre. (First seen for that diagnosis less than a year prior to RT, and no previous radiation therapy for any cancer.) Only the time leading up to the start of the first course of treatment was considered, not the time to the second or subsequent episodes of care;
- *And* they had complete data needed for linkage and analysis.

Cancer Care Ontario provided information for 34,259 unique cases receiving radiation therapy at any time during 1999 and 2000. A single patient may represent multiple "cases" if treated for different cancers, but not for multiple tumours or courses of treatment for the same cancer type. Records were reduced to 25,703 new patients with only one kind of cancer diagnosis and with complete radiation therapy consultation and radiation therapy treatment start data.

Princess Margaret Hospital data provided data on 9,169 unique cases receiving radiation therapy at any time during 1999 and 2000, several of which had more than one unique course of treatment [III] or treatment for more than one diagnosis. This was reduced to 6,434 new cancer patients treated with radiation therapy for the first time during this time period.

4.2.3 Analysis

'New patients' (see above) were grouped by cancer type and according to whether or not `their treatment was palliative. Dates were then defined for each patient, including (where applicable): surgery; referral to the centre and/or registration with the centre; the start and end of chemotherapy; the first radiation therapy consultation or assessment; and, the start of treatment.

For CCO patients only, the number of days passing from the date of registration at their regional cancer centre (RCC) to the first consultation with radiation therapy and the start of treatment were reported on. For breast cancer patients, whether or not the patient received chemotherapy was taken into account. For CCO and PMH patients, the number of days passing between surgical resection of breast cancer and the first consultation and treatment with radiation therapy were reported on. This was also performed separately for two regions.

Data are not reported for individual centres (any one RCC nor PMH alone). Where PMH data *could* be pooled with CCO data to provide estimates either for the province or a region, this was done. Where data *could not* reasonably be combined, PMH data are left out of the analysis.

4.3 SUMMARY OF FINDINGS

Observation 1 – Currently available data have strengths and weaknesses for monitoring 'waiting times' for radiation treatment.

The following data elements were deemed to be reliable and comparable between PMH and CCO:

- Dates of consultations and treatment starts (from activity-level clinical data);
- Dates of surgery (obtained from the Canadian Institute for Health Information); and
- Dates of chemotherapy (obtained from OHIP billing records).

Together, these strong elements provided a glimpse at the time period leading to radiation therapy start for important groups of patients. However, still undefined were waiting times for patients not receiving surgery, those who develop the need for radiation therapy during ongoing care or those who never receive radiation therapy (including those still waiting).

The following data elements were either missing from one of the sources or lacked consistency between CCO and PMH:

- Date of diagnosis (Ontario Cancer Registry data not available for this project).
- Disease stage and intent of treatment for each episode of radiation therapy.
- Date of referral for radiation therapy (see below).
- The earliest date that the patient is truly eligible to start treatment.
- The start of systemic therapy (e.g., hormonal drugs) which might modify the benefit and urgency of radiation therapy, and affect the timing of surgery.

These dates are critical if 'waiting time' is defined as time periods during which a cancer centre is unable to start a ready and eligible patient on RT. Date of diagnosis should be available in the future, depending on data sharing agreements. The province-wide data capture of disease stage has been proposed.[1-3]

Documenting a consistent date of referral is something all centres are encouraged to address. Referral procedures differ between PMH and the CCO centres (and vary by diagnosis within centres). During the period studied, PMH was not mandated to accept referrals for radiation therapy if they could not provide care in a reasonable period of time; whereas CCO centres are to accept patients

from their region. At the time, both PMH and CCO directed patients facing long delays to a Central Re-referral Office (CRO). Referral was to other Ontario centres and, at that time, to the United States.

In the future, mechanisms must exist to ensure that eligible patients have equal access to radiation therapy services. A common and fair point of referral would be part of this process. Therefore, PMH and all CCO centres should adopt a common definition of date of referral for radiation therapy assessment (whether or not they ultimately treat the patient). Arguably, this is most urgently needed for the three centres in the Greater Toronto-Hamilton-Niagara region (PMH plus two regional cancer centres). This is the geographical area where delays have been the worst, and these centres overlap significantly in terms of the patient population served.

The date of readiness to start treatment should also be collected. Centres should not be penalized for apparent delays if patients are referred long before they are ready for treatment (i.e., to get in the queue). However, delays in preparing the patient for treatment (including diagnostic imaging and post-surgical complications) should also be tracked and minimized, from the standpoint of maximizing overall quality of care.

Observation 2 – Reporting 'waiting times' is complex.

Consensus was not sought in terms of what should be reported by cancer centres. Instead, several distinct intervals in the treatment process were reported (diagnosis to referral; from consultations to treatment; and times relative to other therapy).

No single definition serves all purposes. To monitor the timeliness of care provided by radiation therapy centres, time periods involving referral, consultations and assessments, readiness to treat and treatment, are relevant. There is also a bigger picture to consider. To maximize quality of care overall, it is important to follow times from clinical diagnosis to the point when the patient has received access to all appropriate forms of oncology care. This includes the timeliness of management of recurrences and disease progression.

Observation 3 – Analyses confirm that long 'waiting times' for radiation therapy existed for breast and prostate cancer patients during the period studied.

Cancer Care Ontario had previously reported that the median time from registration at any Ontario cancer centre to the start of radiation therapy was several months for adjuvant breast cancer patients. The organization had not been able to account for time spent on chemotherapy prior to radiation therapy. This analysis confirms that long times from registration to radiation therapy were often attributable to chemotherapy. However, for patients *not* receiving adjuvant intravenous chemotherapy prior to radiation therapy, the median number of days from registration to treatment was 59 days for Cancer Care Ontario. When province-wide data from Cancer Care Ontario and Princess Margaret Hospital were pooled, the median time from breast cancer resection of the start of adjuvant radiation therapy (without adjuvant chemotherapy) was 84 days.

Overall, during the period ending prior to the establishment of an after-hours clinic, waiting times for breast cancer patients were longer than recommended by professional agencies.
We do feel that data suggest long waiting times for prostate cancer. However, our analysis of waiting times for prostate cancer is also seriously hampered by lack of data on clinical management (unlike breast cancer, time periods cannot be anchored on surgery for most cases). Half of prostate cases receiving radiation therapy started this treatment three months after registration. For both breast and prostate cancer cases, it is not known if patients were referred to centres initially for

radiation therapy, if they were truly ready to start treatment, or if they were receiving oral drugs aimed at cancer control during the interval prior to radiation therapy.

Observation 4 – Available data shows that patient care is managed such that relatively more urgent cases receive care sooner.

Many forms of palliative radiation therapy are treated as urgent cases in all of Ontario's cancer centres. This was illustrated by the data in that breast and prostate cancer patients receiving palliative radiation therapy were treated relatively sooner than those receiving non-palliative care. There was also a gradient in the number of days from registration to treatment for different types of cancer. The median number of days from registration to first radiation therapy consult for head and neck cancer and cervical cancer were seven and eight days respectively (as opposed to 28 days for adjuvant breast cases). Total times from registration to treatment were also shorter.

Observation 5 – Anticipated regional differences were found.

Our analysis also contrasted 'waiting times' for comparable non-palliative breast cancer patients in the three centres: Princess Margaret Hospital, Toronto-Sunnybrook Regional Cancer Centre and Hamilton Regional Cancer Centre to the rest of the province. For each time interval examined, the median number of days was higher in the Toronto-Hamilton region. Most patients redirected through the Cancer Re-referral Office were from this region. This merely confirms other evidence that this heavily populated area has relatively greater problems with access and is the reason that two additional cancer centres for southern central Ontario are to be opened fully in coming years.

4.4 RECOMMENDATIONS FOLLOWING DATA ASSESSMENT AND ANALYSIS

1) This project supports other statements (by CCO, PMH and MOHLTC) that data to monitor cancer care services, including 'waiting times', should be enhanced.
2) All centres providing radiation therapy should monitor and publicly report on their ability to treat patients in a timely manner.
3) Ongoing data should be presented, by institution, in a manner that is comparable.
4) Data reported should include valid statements of the dates of referral for radiation therapy consultation, as well as clinical events reflecting processes of care including: receipt of other treatment and when the patient is ready for treatment.
5) Data should be presented for several distinct patient groups, relatively homogeneous with respect to diagnosis, intention of treatment and relative urgency.

5. CONSULTATIONS

5.1 SYNOPSIS OF MEETINGS

5.1.1 First stakeholders meeting

At a meeting on November 22, 2000, ICES staff presented the goals and objectives of the project. Dr. Christopher Morgan gave a presentation on the Cardiac Care Network (CCN). CCN manages and monitors waiting times for major cardiac care interventions. The project team also introduced other 'waiting time' projects in Canada and queue management examples specific to oncology (radiation therapy and chemotherapy) in other jurisdictions such as the National Health Service in the United Kingdom.

Common features of the waiting-time monitoring systems presented are:

- Fair and open registration of a patient to enter the queue.
- Classification of patients by relative urgency at the time; of registration.
- Regular, timely public reports on times spent waiting for treatment.
  - Using standard definitions for all treating centres.
  - Reported by centre and urgency rating.
- Waiting times data are used to inform management decisions, and to secure resources needed to maintain reasonable waiting times, with little patient movement from their centre of choice.
- Although reporting is standardized, management of facilities and resources remains within individual centres.

There was discussion about the pros and cons of attempting to replicate the CCN approach for radiation therapy in Ontario. This included the usefulness and validity of assigning urgency ratings to cancer patients. It was noted that the term 'elective' should not be used in favour of terms such as 'normal' or 'standard'.

The project team requested volunteers or recommendations for membership in the smaller Working Group.

5.1.2 First Working Group meeting

The Working Group met initially on April 25, 2001. At this meeting, the study team presented the methodology and preliminary findings of the systematic literature search, and distributed the first draft of the comprehensive literature review for critique. Included was a complete review of international guidelines for time to treatment and first drafts of reviews of observational studies pertaining to cancer of the female breast, as well as several other cancers in which essentially no relevant studies were identified.

Members of the Working Group suggested that there were additional unpublished studies that might further inform this review. The project team agreed to locate unpublished reports, but strongly felt

that unpublished reports/data should not be given the same weight as reports than had been successfully peer-reviewed. The project team also planned to include foreign language publications.

Discussion of data focused on goals of the analysis and delays in obtaining approvals.

Finally, there was a discussion about the degree to which Radiation Oncology departments manage patients with different relative urgency. It was noted that informal and formal prioritization took place. Formal prioritization existed in the treatment of high urgency cases (often palliative) through a Rapid Response System operating in all centres. Several centres currently (or had in the past) used urgency categories in their booking systems and/or intramural data analysis. It was also noted that allocation of resources to different disease-site groups (such as protecting clinic staff and time for head and neck cases relative to breast and prostate cases) was implicit recognition of differences in urgency.

5.1.3 Second Working Group meeting

On November 1, 2001, the Working Group met for the second time with two objectives: to update findings of the literature reviews and discuss preliminary findings from the data analyses.

Inclusion of unpublished and foreign language reports in the literature review did not alter conclusions presented at the first Working Group meeting. No further questions or concerns were raised about the literature review.

With respect to the data analysis, the following was presented:

- The project team described the data elements obtained from CCO, PMH and ICES.
- Differences between CCO and PMH were discussed in terms of data content, data processing, and management and staffing of information systems.
- The project team presented the case-processing procedures used to create an analysis cohort approximating 'new cancer cases' referred for radiation therapy for the first time for that diagnosis and receiving a first or only course of radiation therapy which commenced in 1999 and 2000. This included a presentation of the numbers of observations included in the CCO and PMH data sets and the definitions of eligibility included from both sources.
- Preliminary findings from CCO data were presented for review and critique.

5.1.4 Second and final stakeholders meeting

All stakeholders were invited to the final meeting on January 30, 2002. The project team presented a series of observations and recommendations arising from the literature reviews, as summarized above, and data analysis. Direction was sought from the working group on how best to present findings and recommendations to policy makers, the academic community and the public.

With respect to data analysis, the following was presented:

- A description of the case-processing procedures used to define the analysis subset approximating 'new cancer cases receiving RT'.
- Findings from CCO regional cancer centres and data from PMH.

There was much discussion about the data presented. A concern was raised that PMH and CCO data, as analyzed, might reflect different proportions of the total new caseloads for the different centres. The project team indicated that the following would be carried out after the meeting:

- Analysis of both the CCO and PMH data would be carefully reviewed, particularly with respect to the selection of cases for analysis, and limitations in interpretation of the data.
- Data would not be presented for individual institutions. PMH data that could not be pooled fairly with CCO data would be excluded from reports.
- Data from PMH and CCO would be combined to the extent that data elements were reliable and comparable to form provincial estimates.
- Selected data would be presented separately for two regional strata of the province: Toronto (two institutions) plus Hamilton, compared to the remaining centres in Ontario.
- Data for adjuvant breast cancer therapy and palliative care were informative if not perfect, while the quality of data for prostate care (which lacks information about hormonal therapy and the true start of treatment) is not good enough to serve well for monitoring purposes. Stakeholder representatives with clinical and management duties were in agreement that that waiting times in prostate cancer care were long, but little data exist to document this quantitatively.

Discussion of the data analysis focused on the limitations of available data to monitor 'waiting times', as well as the advantages and disadvantages of presenting the observations of this analysis for the defined time period.

The data analysis underscored problems with timeliness of care that were already known to exist for the time period studied. Although knowledge of the problem was not new, the analysis was seen to make a unique contribution to clarifying data quality concerns and enhancing the ability to track the problem. The data presented can serve as an imperfect but important baseline against which to monitor future progress in reducing waiting times.

5.2 PARALLEL CONSULTATION PROCESSES

At the same time as this project was progressing, a series of other groups were looking at the quality of administrative data documenting cancer treatment services and the ability of the system to evaluate care delivery and organization. Several of these processes included the Principal Investigator of this project and/or several other members of the stakeholders committee for this project.

5.3 RECOMMENDATIONS FROM CONSULTATIONS

1) Data needed to monitor 'waiting times' should be enhanced across the province.
    a) All centres should collaborate to create consistent data definitions, and comparable data capturing systems.
    b) This will require resources for data management (particularly human resources) beyond what now resides within Departments of Radiation Oncology.
    c) This recommendation echoes other calls for improved data systems to monitor all aspects of cancer care delivery.

2) As long as timely access to radiation therapy remains a problem in Ontario, a formal queue-management system (akin to the Cardiac Care Network) should exist. This should be established as soon as possible.

   a) For expediency, the Toronto-Sunnybrook Regional Cancer Centre, Princess Margaret Hospital and possibly the Hamilton Regional Cancer Centre, are encouraged to collaborate and propose a model for a system that serves their needs, without waiting for a province-wide decision.

   b) The system should include a fair and equitable referral process and public reporting of waiting times by centre.

   c) Reporting should be complex. 'Waiting times' should be reported separately for patient groups defined by disease, intent of therapy, and other treatment received. The use of nominal categories of relative urgency (especially within patient groups defined by diagnosis and intent of treatment) was seen as optional. If the centres do choose to adopt urgency categories, they should use the same definitions.

   d) Reporting should also include process indicators, such as time required for chemotherapy, surgical healing, staging and other pre-treatment work.

   e) It is recognized that Toronto-Sunnybrook Regional Cancer Centre, Princess Margaret Hospital and the after-hours clinic established at the end of the time period under study continue to use and support a re-referral system between the three institutions for patients with breast and prostate cancer. This collaboration is highly valued and should be expanded and formalized to permit monitoring of waiting times.

6. FINAL RECOMMENDATIONS

6.1 FUTURE REPORTING OF WAITING TIMES

All cancer treatment centres should move toward being able to report how long patients referred to them must wait to receive all forms of radiation therapy care, and should do so as soon as is practicable. Beyond the issue of accountability, monitoring of changes in waiting times will be essential to evaluate the impact of efforts to shorten waiting times, be through expansion of treatment capacity, or other procedural and administrative changes. This working group feels that this goal would be achievable within a matter of months, if appropriate new resources are made available.

6.2 DATA SYSTEM ENHANCEMENTS

To meet the first recommendation, existing data systems must be enhanced with respect to the following:

- New data fields should be added including the dates of important clinical processes (request for referral, referral, consultation and when the patient could begin treatment).
- Data on intent of treatment, concurrent treatment and disease stage should be uniformly available to interpret waiting time information.
- Key data elements should be defined, and reported in the same across all centres.
- It must be possible to bring together data from different sources to complete information about the nature of the disease, goals of treatment, treatment processes and outcomes of care.

This project did not propose that all centres adopt identical data management or scheduling systems, nor seek to define the ideal scheduling and queue management system.

6.3 CHANGING TARGET WAITING TIMES

No recommendations are made to adopt target waiting times guidelines that would be significantly different or shorter than those already recommended by the Canadian Association of Radiation Oncologists and the centres themselves (including strategies for urgent treatment). However, efforts must be made to shorten typical waiting times for radiation therapy such that the majority of patients are seen within these targets.

6.4 USE OF EXPLICIT PRIORITY CATEGORIES

In future, waiting times should be reported separately for distinct subpopulations of cancer patient. Such categories should reflect the intent of treatment and implicitly, of not explicitly, relative urgency. Existing policies do appear to appear to have an effect of seeing that many of the most urgent patients receive care in a timely manner.

The project team makes no recommendation as to whether or not centres should develop explicit priority ranking categories for use within patient groups defined as above, and makes no recommendation as whether to incorporate such ratings in booking systems.

More research should be done to assess the level of harm associated with delayed start of adjuvant radiation therapy. However, efforts to reduce waiting times shouldn't be held up in wait for definitive research in this area.

7. PROGRESS TOWARD RECOMMENDATIONS

This consultation process was not the only mechanism at work to identify gaps in data systems pertaining to the delivery and monitoring of cancer services, nor has it been alone in recommending data quality improvements. From 2000 through 2002, several of the ICES faculty and stakeholders of this project participated in, or provided data to, related initiatives including the Cancer Services Implementation Committee[3], the Data Tracking, Referral and Analysis of Capacity for Cancer (D-TRACC) program and other processes.

New initiatives and expenditures to address these problems preceded, coincided with and followed this project. Following the report of the Cancer Services Implementation Committee, MOHLTC announced increased funding for cancer treatment and services. The new funding is to be used to expand service capacity, address human resource problems and improve data infrastructure.

The first phase of D-TRACC reported on available data and information gaps in monitoring cancer services and outcomes.[1] The second phase proposed a data structure and plan for new physical and human resources to enhance data systems[2], and the third phase will involve implementation of greatly enhanced collective data system incorporating pathology reporting, diagnostic testing, surgical, systemic and radiation therapy activity level data and outcomes information.

In 2002, MOHLTC gave CCO the mandate for establishing and operating the enhanced data system described by the D-TRACC program. On September 25, 2002, the MOHLTC announced that government funding for cancer care included resources for enhanced data systems. At the same time, they announced the establishment of the Cancer Quality Council of Ontario with a mandate to monitor, assess and improve clinical and health system performance of all cancer services. A major role of the Quality Council will be to improve data quality and facilitate its use to evaluative research.

On November 29, the board of directors of CCO approved the Information Management Strategic Plan (IMSP)[30] which describes the priorities for data enhancements and changes. Specifically announced within this strategic plan are a provincial referral and wait list management systems including all radiation therapy referrals as one of the first areas to be included. The IMSP also outlines improvements to clinical and clinical outcomes data required to monitor the effects and effectiveness of cancer care, including enhancements to the Ontario Cancer Registry and greater access to pathology data and disease stage data. There is every reason to expect that these initiatives will result in greatly enhanced reporting on the delivery of radiation therapy, and ultimately we will see the sequences of care in multidisciplinary oncology compressed to a more reasonable timeline.

TABLES

TABLE 1. Composition of the project team and consultation groups

Institute for Clinical Evaluative Sciences Faculty and Staff	
Dr. Veronique Benk*(and TSRCC)*	Ms. Cindy Li
Dr. Susan Bondy	Ms. Nancy MacCallum
Ms. Davida Glazer	Mr. Raymond Przybysz
Dr. David Hodgson *(and PMH)*	Ms. Pam Slaughter
Dr. Neill Iscoe *(and TSRCC)*	Ms. Jeanette Tedford
Dr. Andreas Laupacis	Ms. Linda Toews
	Mr. Wayne Tucker
Stakeholder Group	
Dr. Ida Ackerman, *TSRCC*	Ms. Gillian Humphreys, *CCS Volunteer*
Dr. Rob Barnett, *Grand River Hospital/RCC*	Ms. Karen Anne Johnson, *CCS*
Dr. Robert Bell, *UHN/PMH*	Dr. Birthe Jorgensen, *MOHLTC*
Dr. Randy Bissett*, NEORCC*	Ms. Marilyn King, *CCS Volunteer*
Dr. Catherine de Metz, *WRCC/KRCC*	Dr. Les Levin, *MOHLTC*
Dr. Peter Dixon, *Durham RCC*	Ms. Sandy Nuttall, *MOHLTC*
Dr. Shelley Fine, *Credit Valley Hospital*	Dr. Brian O'Sullivan, *PMH*
Dr. Andre Girard, *ORCC*	Mr. David Payne, *PMH*
Dr. Mary Gospodarowicz, *PMH*	Ms. Sheila Robson, *TSRCC*
Dr. Sunil Gulavita, *NWORCC/CCO*	Dr. John Schreiner, *KRCC*
	Dr. Tony Whitton, *HRCC/CCO*
Working Group	
Dr. Ida Ackerman, *TSRCC*	Ms. Karen Anne Johnson, *Ontario Association of Medical Radiation Oncologists*
Dr. Rob Barnett, *Grand River Hospital/RCC*	Ms. Marilyn King, *CCS Volunteer*
Dr. Robert Bell, *UHN/PMH*	Dr. Brian O'Sullivan, *PMH*
Dr. Shelley Fine, *Credit Valley Hospital*	Ms. Sheila Robson, *TSRCC*
Dr. Mary Gospodarowicz, *PMH*	Dr. Tony Whitton, *HRCC/CCO*
Ms. Gillian Humphreys, *CCS Volunteer*	

TABLE 2. Summary of evidence-based clinical practice guidelines. These guidelines make explicit statements about the time within which recommended radiation therapy should occur.

Country	Report	Findings	Basis for Recommendation
		BREAST CANCER	
Canada	Breast irradiation in women with early-stage invasive breast cancer following breast conserving surgery (2002) (Practice Guideline Report No. 1-2; Update of CPG dated March 1997).[31] Accessible: http://www.ccopebc.ca/guidelines/bre/cpg1_2f.html#summary http://www.cancercare.on.ca	Recommendation: Local breast irradiation should be started as soon as possible after surgery and not later than 12 weeks after, except for patients in whom RT is preceded by chemotherapy. The report also states, "The optimal interval between BCS and the start of irradiation has not been defined."	1) In a 1985 study from the Institut Gustave-Roussy, patients who began RT more than 7 weeks after BCS appeared to have a greater risk of recurrence (14%) than patients receiving treatment earlier (5%). However, the interval between RT and surgery was not significant when other relevant factors were considered in multivariate analysis (Level III evidence). 2) In a 1994 study by Nixon of node-negative patients who received a dose of 60 Gy or greater to the primary tumour site, when risk factors were controlled, there was no difference in recurrence rates associated with intervals ranging from 4-8 weeks between surgery and RT (Level III evidence). 3) Studies by Fisher, Levine and Wallgren reported that delaying RT until chemotherapy was complete did not show any apparent increase in local recurrence.
United Kingdom	Joint Council for Clinical Oncology. Reducing delays in cancer treatment: some targets. London: Royal College of Physicians; 1993. Annex 4: Recommended waiting time targets.[32] Accessible: http://www.sign.ac.uk/guidelines/fulltext/29/annex4.html http://www.sign.ac.uk/pdf/sign29.pdf	Recommended waiting time targets from the date of first oncology consultation to start of RT or chemotherapy: • Urgent radiation therapy or chemotherapy: good practice = 24 hours; maximum acceptable = 48 hours. • Palliative RT (according to symptom severity): good practice = 48 hours; maximum acceptable = 2 weeks (non-severe symptoms). • Radical RT involving complex treatment planning: good practice = 2 weeks; maximum acceptable = 4 weeks.	Joint Council for Clinical Oncology. Reducing delays in cancer treatment: some targets. London: Royal College of Physicians; 1993 Joint Council for Clinical Oncology. Reducing delays in cancer treatment: some targets. In: Breast Cancer in Women: A National Clinical Guideline. Scottish Intercollegiate Guideline Network Publication No. 29, 1998.

Country	Report	Findings	Basis for Recommendation
United States	Treatment of Early-stage Breast Cancer, June 1990. NIH Consensus Statement [33] Accessible: http://odp.od.nih.gov/consensus/cons/081/081_statement.htm	Guideline states that in patients receiving adjuvant chemotherapy, no precise recommendations regarding the sequence and timing of RT and chemotherapy can be given.	
RECTAL CANCER			
United Kingdom	National Health Services (1997) [34;35] Accessible: http://www.doh.gov.uk/cancer/radiationtherapy.htm	UK National Health Service Guidelines make a recommendation regarding the timing of RT, namely, that it be started within four weeks of the decision to provide the treatment.	This recommendation is based on expert opinion, generally accepted to be Grade C: 'evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.'
LUNG CANCER			
United Kingdom	National Health Services (1998) [36] Accessible: http://www.doh.gov.uk/cancer/radiotherapy.htm	Guidelines from the UK address the issue of delay of radiation treatment for lung cancer, recommending an interval between diagnosis and initiation of treatment no longer than four weeks.	The evidence for this recommendation is categorized as Grade C: 'evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.'

TABLE 3. Summary of elements in data sets from Cancer Care Ontario and Princess Margaret Hospital.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Date of registration	Date of registration at CCO is, in most cases, captured objectively from a standardized referral process. Date is specific to each diagnosis per patient although variations may occur. Registration is not unique per tumour of same type (ICD); not unique to RT nor to distinct episode of care (such as initial treatment and re-treatment at the time of progression or recurrence).	Date of registration is specific to the host hospital (UHN) rather than to oncology (see date of referral below).	Data across institutions are not viewed as comparable.	Data from both sources are valid for their uses within individual institutions, and relevant to this analysis. However dates are not comparable across centres. Neither adequately reflects true patient eligibility for RT, nor start time for radiation therapy queue. In either case, the date of referral or request relative to readiness for radiation therapy is not under the control of the cancer centre, may be influenced by external factors, and may not reflect when the patient is ready to receive RT.
Date of request	See date of registration. A small number of patients have a date of referral distinct from registration date.	Date of the request for the RT consultation. This may or not be in close proximity to the first contact with PMH and/or UHN. Data, when present, are considered to be valid and relevant. Data not available for all patients, depending on mechanism of referral.	Data across institutions are not viewed as comparable.	
Date of diagnosis	This date in records provided was completed by clinical staff and the definition used may vary. See comments.	This date in records provided was completed by clinical staff and the definition used may vary. See comments.	Not used in analysis. See comments	Valid date of diagnosis is captured through the Ontario Cancer Registry with standard definitions for all Ontario patients. Linked registry data were not available for this study.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Date of initial assessment (RT consult-ation)	Date of first radiation therapy consultation. Objectively defined and administratively captured. Accuracy of date established through comparison with external sources (OHIP billing records).	Date of first radiation therapy consultation. Objectively defined and administratively captured. Accuracy of date established through comparison with external sources (OHIP billing records).	At face value, data are valid and com-parable. But 1) structure of data varies. CCO data reflect first episode of care for that diagnosis; whereas PMH data reflect each episode of care, including several for the same diagnosis; and 2) institutional policies vary.	For this analysis, comparability between sources was created by taking only the first episode of care per diagnosis, and only first diagnosis per patient. It is recommended that centres capture unique process data for each distinct episode of care.
Date of decision to use radiation	Not captured. No obvious consensus as to definition of date of decision to treat or use.	Not captured electronically. No obvious consensus as to definition of date of decision to treat or use.	Lack of data.	A standardized definition is needed before prospective data could be considered.
Date of decision how to treat	Date of the first simulation (SIM).	Date of the first simulation (SIM).	Objective and comparable data.	Start of SIM is captured reliably. However, SIM may be postponed until just prior to treatment. Analysis here focused instead on start of actual therapy.
Earliest date at which patient is ready to start RT	Not available.	Not available.	Lack of data.	This is an important but complex construct. Earliest readiness for treatment would need a common definition based on completion of staging, other therapy, planning and functional status.
Dates of first and last RT treatment	Objectively defined and administratively captured.	Objectively defined and administratively captured.	Reliable, comparable data. See comments.	Valid, comparable data. However, start of treatment may reflect queue and clinical circumstances not captured in available data.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Intent to treat	Not available. Entered and used in all centres but without standardized definition. Palliative treatment intent was derived using validated algorithms based on fractionation and body region irradiated.	Captured in electronic data from self-report by clinical staff. However, definitions and means of capture are not standardized.	Data elements are not identical, but considered sufficiently close, and important, to permit use of data from two sources to be used together, in a limited way, for selected diagnoses.	It is recommended that intent of treatment for each episode of care be captured using common definitions.
Site of treatment	Available. Derived from ICD-9 codes. Data reported by clinical staff.	Available. Derived from ICD-9 codes. Data reported by clinical staff.	Data capture not identical but reasonable for comparison.	Validation against OCR and detailed records should be incorporated in future analyses.
Disease stage	Stage is typically available to clinical staff. Electronic data provided include a data table with disease stage, however stage is not part of minimum standard. (Province-wide) data set and definition used may vary. Data provided may not reflect stage at start of RT.	Stage data exist in clinical records but not provided in electronic data.	Not used. Treatment intent was used as a partial proxy for disease stage at start of RT.	Recommendations to include disease stage in all clinical data have been made by PMH, CCO and MOHLTC.
Treatment dose	Provided in clinical data, but not used.	Not provided in electronic data.	Not used.	Not critical.
Date of surgery	Date of the latest surgical procedure aimed at the primary cancer before the start of radiation therapy; derived from CIHI (1997-99) and from OHIP (2000).	Date of the latest surgical procedure aimed at the primary cancer before the start of radiation therapy; derived from CIHI (1997-99) and from OHIP (2000).	Comparable data incorporated from external source.	Objective data are important for resected cases. However, date of definitive resection assigned from hospital records may not be most important date clinically or for queue monitoring.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Date of first and last chemo-therapy (CT)	Detailed activity level data on CT delivered within that centre are part of centre records; CT outside centre requires separate data sources. CT data incorporated via record linkage to OHIP billing records.	Detailed activity level data on CT delivered within that centre are part of centre records; CT outside centre requires separate data sources. CT data incorporated via record linkage to OHIP billing records.	Centre CT data not used. Comparable dates derived from external source for both data sources.	Complete and consistent data on IV chemotherapy, regardless of where received, should be part of prospective radiation therapy queue monitoring. This should complete data on oral agents as well. (Not incorporated here).
History of previous RT (before 1999 – used for exclusion).	RT treatment history was provided by CCO and validated against radiation therapy consultation billing records for 1991 through 1998.	PMH provided data for new patients without complete history. History of radiation therapy incorporated from linkage to OHIP billing records.	Data structures not identical, but external data provided basis for creation of com-parable 'new patient' case series.	Should be captured by all institutions in a uniform manner.

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ENDNOTES

[I] The complete list of clinical practice guidelines reviewed is available upon request from ICES. Not counted as relevant were guidelines which recommended RT without making comment about the time period within which this should occur. Guidelines may have made comment about the research evidence pertaining to varying fractionation schedules, such as to compare relatively higher dose, more compressed courses of therapy with longer courses of therapy. These were not considered germane.

[II] In addition to the disease-specific guidelines included in the table, guidelines for various disease sites, published by the National Health Service (e.g., [37]) contained recommendations against delay in treatment (not specific to radiation therapy, but could include surgery or chemotherapy). An example of guidelines for timeliness of care adopted in one UK hospital (The Prince Philip Hospital) was also identified through World Wide Web sources.[38] This statement indicated:

- The time interval between breast conserving surgery and post-operative radiation therapy should not exceed 20 working days except for clinical reasons; and
- For patients requiring palliative radiation therapy, the time interval should not exceed a maximum of 10 working days for non-severe symptoms, and should not exceed 48 hours for urgent symptom control.

[III] This represents a fundamental difference in the data structure between the two institutions and is one of the reasons that the analysis was restricted to estimating days between referral and treatment for new patients, and for the first course of treatment only.

APPENDIX A: LITERATURE REVIEWS

TABLE OF CONTENTS

1. METHODOLOGY

The literature reviews undertaken can be described in three sections:

1) A systematic overview of scientific studies addressing the impact of delayed radiation therapy (RT) on disease outcomes in selected cancer sites (female breast, lung, prostate, head and neck, uterine cervix and endometrium, and rectum).

2) A review of evidence-based clinical guidelines on RT management with respect to delays including the use of priority rankings (and scientific justification for priority rankings if used).

3) Informal reviews of literature pertaining to the determinants of clinical urgency.

Structured Review

A systematic overview was completed on the subject of the impact of delayed radiotherapy on disease outcomes. The review considered published experimental or observational studies in selected cancer sites or indications, namely: female breast, lung, prostate, head and neck (tonsils, nasopharynx and larynx), uterine cervix and endometrium, and rectum.

Very broad key- and text-word literature searches were carried out of major health and medical bibliographic databases (including Medline, EMBASE, the Cochrane Library, HealthSTAR, Best Evidence, Science Reference Index and several cancer-specific databases). Automated searches were primarily limited to the range 1997 to 2000, although this was supplemented in several ways including back-referencing and searches for contributions by authors known to publish in the area. Electronic searches required an English-language abstract, but relevant papers written in English, French, German, Italian, Polish, Russian, Spanish and Portuguese were retained.

Grey literature (e.g., material published by public and non-governmental organizations) and clinical practice guidelines were identified through a compendium of major international cancer agencies, back-referencing, and through the recommendations of stakeholders. References in these publications were reviewed. In all, 155 Internet sites were examined. Whenever a relevant report or study was found, literature cited in that report was searched for additional reports relevant to this project. In addition, author name searches were carried out for all available publication years for selected authors who had contributed relevant studies or reports to the literature.

A total of 1,579 abstracts were identified from initial literature searches and each was reviewed for relevance by two members of the research team. The full texts of 543 relevant articles were obtained, which were then critically reviewed and summarized by teams of ICES faculty.

After the first working group meeting, relevant unpublished manuscripts were also considered. To find these, a letter was sent to the CEOs of all specialized cancer centres in Canada and other experts asking them to identify unpublished reports in this area. Studies identified were discussed in the second draft of the literature review.

Informal Literature Reviews

Two other areas for literature review were identified at the outset, but not completed using the full systematic approach described above. The first was a review of general principles in tumour biology to determine whether evidence existed indicating that some forms of cancer warranted greater urgency than others for RT. A total of 15 textbooks of medicine, oncology and radiation oncology and approximately 20 review articles on the biology of RT were reviewed.[1-13;13;14;14-20] The goal was to determine if there existed a general system to define relative urgency for RT.

The inclusion of a review of the impact of delayed RT on the psychological and social well-being of the patient was also proposed. However, after the first two meetings, it was apparent that all were in agreement that waiting for RT caused anxiety and stress for patients and caregivers alike. There was little benefit in trying to quantify this harm, as it was not going to change recommendations about appropriate waiting times. As well, during the active phase of the project, a research report appeared, using qualitative research methods, which clearly expressed the effect that waiting had on patients and car-givers at the Princess Margaret Hospital.[21]

2. BREAST CANCER

— Prepared by Veronique Benk

Scientific Reports

There is biological evidence supporting the view that delaying adjuvant radiotherapy has a detrimental effect on treatment outcome.[22;23] Radiobiological studies suggest that the massive cell depletion that occurs with surgical excision of the primary tumour is a powerful stimulus for the growth of residual tumour cells, due to the release of growth factors secondary to tissue injury or via other mechanisms. Thus, within a short period of time following primary surgery, one might expect accelerated re-population by any remaining tumour cells. Other clinical studies confirm that delay compromises local tumour control.[3;24;25]

In the peer-reviewed articles examined, the minimum follow-up was 60 months and local failures were usually observed within 30 months of the initial diagnosis. Only one prospective study addressed the impact of delay; it compared the sequence radiotherapy-chemotherapy with the sequence chemotherapy-radiotherapy.[26] All the other trials have been retrospective, the design that lends itself best to the study of the impact of delay on outcome from an ethical standpoint. Technically, the radiation fractionation schedules ranged from 40 Gy in 16 fractions to 50 Gy in 25 fractions, which were or were not followed by a boost of 10 to 16 Gy, reflecting variations in clinical practice. In summary, for patient not receiving chemotherapy, three authors out of six showed that a delay of up to 50 days increases the risk of local recurrence. For patients receiving chemotherapy, four authors out of seven suggested that delay greater than 180 days increases the risk of local recurrence.

Clinical Guidelines

Of the various treatment guidelines reviewed, only the Canadian[27] and UK[28;29] guidelines contained recommendations about time to treatment. In Canada, the recommendations of the steering committee on clinical practice guidelines for the care and treatment of breast cancer recommends that local breast irradiation should be started as soon as possible after surgery and not later than 12 weeks after, except for patients receiving chemotherapy.[27] This recommendation was based on the

Ontario Clinical Oncology Group trial where the maximum interval between surgery and radiation was 12 weeks (level 3 evidence – evidence derived primarily from expert opinion and consensus). For patients receiving chemotherapy, no optimal interval has been defined. In the UK[30], the recommended time interval between breast conserving surgery and postoperative surgery should not exceed 20 working days, except for clinical reasons. In the United States and Australia, there are no specific recommendations.

3. LUNG CANCER

— Prepared by Lawrence Paszat

Scientific Reports

Peer-reviewed publications of clinical trials have been examined and do not shed light on the influence of RT delay on outcomes for patients with lung cancer. No studies address this issue directly. Studies addressing the timing of radiation treatment during concurrent therapy for small cell lung cancer have not shown a disadvantage of delayed RT compared to early RT.

Treatment Guidelines

Treatment guidelines from Canada, the USA and the UK have been reviewed. Only guidelines from the UK[31] in any way addressed the issue of delay of radiation treatment for lung cancer, recommending an interval between diagnosis and initiation of treatment no longer than four weeks. The evidence for this recommendation is categorized as Grade C: 'evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality.'

4. PROSTATE CANCER

— Prepared by Veronique Benk

Scientific Reports

Peer reviewed publications of clinical trials have been examined. These studies address the indications of radiation treatment as the only modality of treatment, or after radical prostatectomy.

After radical prostatectomy, the timing of the radiation treatment was addressed in two articles. McCarthy[32] reported in a small prospective study on 64 stage III patients who received their postoperative radiation either within six months (<6 months) or after six months (>6 months). No difference in outcome was found between the early and the delayed adjuvant radiotherapy. However, a review article[33] recommended that adjuvant radiation should be started within three months (<12 weeks) and, at the latest, four months (<4 months) after surgery to avoid neoplastic repopulation.

Discussing radiation as radical treatment, two articles reported on the impact of the interval between diagnosis and treatment in the pre-PSA era.[34;35] A retrospective study of 170 patients

showed that the patients who waited longer for their radiation treatment had a worse survival (37% vs. 56% at 5 years).[34] Preston[35] reported on 116 patients and showed that a delay of more than twelve months had an impact on survival. In the PSA era, the interval between diagnosis and treatment has not been reported as a prognostic factor. To the contrary, watchful waiting is recommended for selected populations (i.e., low-grade adenocarcinoma in patients with a life expectancy of less than ten years because of advanced age or other co-morbidities).

Clinical Guidelines

Treatment guidelines from Canada, the United Kingdom and the United States have been reviewed. None address the issue of delay of radiation treatment for prostate cancer.

5. CANCERS OF THE HEAD AND NECK

— Prepared by Neill Iscoe

Scientific Reports

As noted with the other disease sites, no comparative studies have examined the impact of planned delays in the commencement of RT for head and neck malignancies. All information related to the issue of delays in radiation treatment, either at the beginning or during therapy, has been derived from retrospective studies with some finding no impact of delay[36-38] and others finding delay detrimental.[24;25;39-44] However, one study noted that delays in therapy could be attributed to differences in patient characteristics or treatment selection. The authors followed up on previous reports from their own institution[25;44] and noted that a disproportionate number of patients who received delayed RT received "suboptimal" doses of radiation.[38] When they examined the small number of patients who had delayed but adequate dose RT, they found a low rate of locoregional failure. They concluded that the previous observations about a negative impact could not be supported by a more detailed assessment of the patient group. This report raises concerns about conclusions drawn from the other series in which the reports were based on sub-experimental research designs. Thus, while there are theoretical and intuitive reasons to believe delays in RT would be detrimental to patient outcomes, reports on the management of head and neck cancers cannot enlighten the issue in any meaningful manner.

Fortin et al. studied the effect of delays in radiation delivery at one hospital in Quebec between 1988 and 1997.[45] This retrospective analysis examined the effect of changes in the time from radiation oncology consultation to the start of radiation for 623 patients with head and neck cancers of stage designation: T1-2, N0,1. The authors indicate there was little change in the times from biopsy to referral and from referral to actual consultation during this period. However, a significantly greater proportion of patients waited longer in the latter period with a median time from consultation to radiotherapy of 14 days in 1989 and 31 days in 1997. A slight, and non-significant, impairment in survival was observed for patients who had treatment delayed up to 10 days from the reference group but a significant effect if the delay was more than 20 days. While the study is retrospective and there appear to be small changes in the distribution of daily dose rates among the various groups, it provides some cause for concern that the critical timeframe for patients with head and neck cancer is probably measured in weeks and not months.

6. CANCER OF THE UTERINE CERVIX AND ENDOMETRIUM

— Prepared by Susan Bondy

Scientific Reports

The effectiveness of radiation therapy in the treatment of cancers of the uterine cervix and endometrium has been clearly demonstrated. RT is used for pelvic control of advanced or recurrent endometrial and cervical cancer and may be considered as adjuvant therapy in women with less advanced disease at high risk of recurrence. Recommended therapy typically combines high voltage external beam radiation with low dose rate brachytherapy. RT may also be used for the treatment of early stage invasive cervical cancer where surgery is contraindicated, and with equal benefit.

A systematic literature search identified no studies which directly addressed the question of delayed start of RT in terms of progression or survival time from cervical or endometrial cancer. A number of reports were identified which addressed what was described as 'delay' in RT for gynecologic cancers. However, each of these pertained to either interruptions in therapy, such as those due to patient preference or co-morbidity, or to a gap in time between the completion of external beam RT and the start of brachytherapy. Such reports do not match the criteria for inclusion in the present overview. Patients should be treated with the most effective regimen available, which will include high-dose, low-fraction therapy without interruption and without significant delays occurring between external beam therapy and brachytherapy.

Treatment Guidelines

Six clinical guidelines on gynecological cancers were reviewed for content pertaining to delaying the start of RT (two each from Canada, the USA and the United Kingdom). None of these included an explicit statement or comment about upper limits on time to start of RT or the state of scientific evidence on this question. The UK guidelines[46] merely include a recommendation to minimize delay in treating cervical and endometrial cancers (which presumably applies to all modes of therapy, not just RT), citing that there are often delays of six months or more between the onset of symptoms and the beginning of treatment. The guideline[46] states: *This may mean that the cancer develops to a higher stage. There is no evidence, however, that survival is impaired by delays of up to three months.* (p.24)

This recommendation is categorized as Grade B: 'evidence derived from randomized controlled trials or systematic reviews of randomized trials.' No specific citations are included in the scientific and professional manuals associated with the guideline. In the same source, a second argument raised for not delaying therapy is anxiety experienced by the patient. This argument is categorized as Grade C evidence – 'evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities.' Again, this recommendation is not specific to RT.

7. RECTAL CANCER

— Prepared by David Hodgson

Scientific Reports

None of the peer-reviewed publications found in the literature search assessed the impact of unplanned radiotherapy delay on outcome in this group of patients.

Randomized trials have compared the outcome of *planned* pre-operative radiotherapy with surgery alone, or *planned* postoperative radiotherapy with surgery alone. These trials have generally found better local control with earlier (preoperative) radiation treatment; however, this may be due to biological factors related to surgery, rather than due to the delay of RT treatment *per se*.

Treatment Guidelines

Treatment guidelines from Canada, the USA, and the United Kingdom were identified and reviewed. These guidelines all make recommendations on the appropriate use of RT for rectal cancer. Only the UK's National Health Service Guidelines[47;48] make a recommendation regarding the timing of RT: namely, that it be started *within four weeks of the decision to provide the treatment*. This recommendation is based on expert opinion, generally accepted to be Grade C: 'evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.'

8. PALLIATION

— Prepared by Susan Bondy

Scientific Reports

No report was identified through the formal search strategy that contained experimental or non-experimental data specifically addressing the issue of timely versus delayed RT for palliative purposes (i.e., none fully met the inclusion criteria for assessment of delayed versus more timely care in relation to quantified patient outcomes). In all, approximately 75 observational studies and review articles and 13 textbooks were examined on the subject of palliative RT (e.g., [49-60]). This section provides a subjective overview of the literature with respect to the relative urgency of RT with palliative intent. These views are not presented as a formal critical overview, but do reflect the opinion of the project team. One important clinical practice guideline was identified.

Reports reviewed typically summarized the evidence of benefit of palliative RT (without discussing delays). The reviews generally summarized the proportion of catastrophic events averted, degree, onset time and duration of pain control. By definition, the goal of palliative RT is to improve quality of life in advanced cancer patients with no explicit expectation of prolonging survival.[4;57;60-62] RT has been shown to be effective in: ameliorating pain; slowing growth of targeted tumour masses, and delaying or avoiding loss of function of healthy tissues due to direct or indirect effects of tumour growth in anatomically sensitive areas. Catastrophic events that may be averted or delayed through palliative RT include spinal cord compression, and fractures resulting from metastases to the bone.[4;63-66] Clinical guidelines of the British Association of Surgical Oncology are most explicit in

stating that palliative management is a matter of some urgency in the instance of severe pain, pending fracture and cord compression, although RT is only one of several appropriate modalities of therapy included in the recommendations.

No global statement can be made about the ideal time to administer palliative RT that would apply to all patients with metastatic disease because need is contingent on the development of indications for this specific form of therapy. This will depend on the type of cancer and histology, the rate of progression, the pattern of disease progression, including the location and size of the metastatic lesions, and response to other therapies.

There are several circumstances in which palliative therapy may legitimately be deemed urgent.[67] These include the presence of severe pain not adequately managed by other means, tumour-associated bleeding, as well as a reasonable probability, in days to weeks, of any of the following events: loss of important healthy function due to tumour growth (e.g., breathing, circulation, sensory function, swallowing, speech); large bone destabilization or fracture; and paralysis due to compression of the spinal cord. This point is formally acknowledged by Princess Margaret Hospital and all regional cancer centres, each of whom have explicit policies to treat urgent palliative care cases, often within 24 to 48 hours.

Two final observations about palliative RT in relation to queue management were raised by members of the project team and working group. First, palliative treatment requires relatively few fractions and requires fewer resources per patient than other forms of RT. However, palliative RT is likely the most grossly underutilized application of RT in Ontario[68;69] and true clinical demand may be unrecorded if clinicians choose not to refer patients to RT because of concerns over delays.

Clinical Guidelines

National Health Service guidelines in the UK state that palliative RT should be delivered within 48 hours; this is extended to two weeks as 'good practice' in the event of non-severe symptoms.[67]

Both Cancer Care Ontario and Princess Margaret Hospital currently have written policies and clinical procedures that give priority to palliative RT aimed at immediate and severe symptoms.

In summation, the effectiveness and relative urgency of palliative RT in the presence of severe symptoms is not controversial.

9. NON-SYSTEMIC LITERATURE SUMMARIES

— Prepared by Susan Bondy

Biological Considerations and Psychological Impact

A number of considerations were identified that might determine the relative urgency of RT. The first consideration is whether radiation is the primary (or sole) mode of therapy used to attempt a cure. Where RT is being used as the primary curative mode (such as in cervical cancer), its delivery is relatively more urgent then in tumours that may be targeted first with surgery or other therapy.

Where other treatment can be substituted for RT, the urgency may be deemed lower. For example, RT may not be elective if it is strictly for pain control and where adequate pain control can be achieved through drug therapy. The concurrent use of alternative forms of adjuvant therapy may be another argument for relatively lower urgency. Arguably, breast cancer patients expected to have a good response to systemic and hormonal therapy may be less disadvantaged by delayed RT, and prostate cancer patients with a good prognosis of long term tumour control using hormonal drugs may be less disadvantaged by RT delays than where the cancer is not responsive to hormonal drugs. These are theoretical considerations, however, and should not be used to justify delayed care in these circumstances.

One biological consideration in establishing relative urgency is the likelihood in the short term that continued growth of primary or secondary tumours will result in regional spread. RT has a greater impact on containing tumour growth in the loco-regional area and in body regions targeted by radiation beams directly, whereas chemotherapy also addresses undetected metastases at distant sites. The likelihood of recurrence in the same region versus more distant sites differs between cancer diagnoses. Even within a single cancer type, histology and size of tumour may determine the likelihood of local versus distant progression.

Another consideration is the relative benefit of keeping residual tumour masses from growing in size such that they will cause irreversible damage or the loss of function to other body tissues or systems when treatment is delayed. These concerns would speak to greater urgency in cancers of the brain, head and neck. RT may be essential to debulk the primary tumour; to preserve breathing, swallowing and CNS function; and to limit disfigurement. Another example is in palliation where RT can have a nearly immediate effect of preventing large-bone fracture, massive blood loss and paralysis.

Similarly, treatment should not be delayed such that primary or residual tumour masses grow to a large size. Large tumours are qualitatively more difficult to treat effectively with RT and chemotherapy. The effect is not simply equal to the number of cells, but because larger tumours develop blood vessels, necrotic masses and more poorly oxygenated areas. When larger tumour masses are treated with RT or chemotherapy, a larger number of tumour cells are expected to survive, posing a greater risk of recurrence and spread. The larger treatment doses required also increase toxicity, and the patient may become ineligible for treatment because he or she cannot tolerate toxic effects. Longer courses of therapy also burden the patient and clinical resources. These considerations would set some upper limit on the duration of time to RT for *all* treatable cancers, even relatively slow-growing tumours.

Another consideration for relative urgency is where another form of effective treatment is held up waiting for RT to be completed. An example would be the use of neo-adjuvant RT (prior to surgery) in the case of rectal cancer. If timely RT is not available, the surgery may be delayed or surgical options limited. This could result in poorer outcomes, such as permanent colostomy which might have been avoided with RT and surgery combined.

Finally, treatment should be timely enough to limit impact on the social or economic well-being of the patient. Children should be treated quickly to limit disruption of physical and emotional development. Ideally, a compassionate and adequately funded system would limit the impact on patients with work and family responsibilities and would treat all patients as quickly as possible to minimize anxiety and disruption of daily activities.

In summary, in all of the biological overviews examined, there existed no single formula or schema to classify the urgency of RT across different disease site groupings or diverse clinical circumstances.

However, ample evidence was found to indicate that real differences exist between tumours and patients in terms of the potential harm associated with delaying RT. The project team concluded that some degree of prioritization of patient subgroups is justifiable. Due to the complexity of these considerations, however, the relative urgency of treatment should be based on clinical circumstances and reflect the judgment of clinical experts with knowledge of the particular patient.

Consideration was given to carrying out a review of the literature on the impact of delays and patient anxiety and distress, and it was concluded that this was unnecessary. Everyone involved in this project understood clearly that delays in RT have been a source of great worry and frustration for patients and clinical staff alike. The environment of distress (for both patients and staff) has been poignantly described in a publication from Princess Margaret Hospital.[21]

TABLES

Table A.1. Recommended waiting time targets in the United Kingdom.

Recommended waiting time targets from the date of first oncology consultation to the start of radiation therapy or chemotherapy are:	
For urgent radiation therapy or chemotherapy	• Good practice = 24 hours • Maximum acceptable = 48 hours
For palliative radiation therapy (according to severity of symptoms)	• Good practice = 48 hours • Maximum acceptable = 2 weeks (for non-severe symptoms)
For radical radiation therapy involving complex treatment planning	• Good practice = 2 weeks • Maximum acceptable = 4 weeks[1]

[1] Where additional specialist staging procedures are necessary

Source: Adapted from Joint Council for Clinical Oncology. "Reducing delays in cancer treatment: some targets". London: Royal College of Physicians, 1993. Annex 4 Recommended waiting time targets.

Table A.2. Quality standards for breast services.

RADIATION THERAPY STANDARDS	SOURCE
The safe limit of workload for a clinical oncologist should be 350 new patients per annum, as recommended by the Royal College of Radiologists.	Board of the Faculty of Clinical Oncology, Royal College of Radiologists. Risk Management in Clinical Oncology, 1995
The time interval between breast conserving surgery and post operative radiation therapy should not exceed 20 working days except for clinical reasons.	Royal College of Physicians and Royal College of Radiologists. Reducing Delays in Cancer Treatments: Some Targets; A Report of the Joint Council for Clinical Oncology, 1993
For patients requiring palliative radiation therapy, the time interval should not exceed a maximum of 10 working days for non-severe symptoms and should not exceed 48 hours for urgent symptom control.	
Recommended minimum staffing levels for the safe use of mega-voltage machines includes both a Senior I and Senior II radiographer, together with 2 WTE basic-grade radiographers.	
Staffing levels for medical physicists should adhere to those recommended by the Institute of Physical Sciences in Medicine.	IPSM. Recommended Minimum Staffing Levels for the Medical Physics Support of Radiation Therapy, Nuclear Medicine, Diagnostic Radiology and Associated Radiation Protection, 1991
Radiation therapy departments should produce a Quality Manual indicating how QA standards are met and should seek to obtain certification in the British Standards Institute Quality System Specification, ISO 9000.	Report of a Working Party for the Standing Committee on Cancer, of the Standing Medical Advisory Committee. QA in Radiotherapy, 1991
Patients receiving breast radiation therapy should be either treated according to a locally agreed protocol developed by the specialist clinical oncologist including a defined technique, total dose given and fractionation regimen, or included in an ethically approved clinical trial.	
QUALITY STANDARDS FOR AUDIT AND RESEARCH	
To minimize local recurrence in the conserved breast, a specialist breast unit should regularly audit its results and aim for a minimum standard of <10% local recurrence in 5 years.	Specialist breast units should be able to publish the following outcome measures: • Timeliness of the service, including waiting times for surgery, chemotherapy and RT. • Local control and survival rates. • Short- and long-term morbidity and toxicity of treatments. • Provider units should support and promote ethically approved clinical research, including multicentre clinical trials aimed at improving treatments for breast cancer and should also publish evidence of such involvement.

Dr Peter Barrett-Lee for the Working Group, Cardiff, building on Joint Council for Clinical Oncology. Reducing delays in cancer treatment: some targets. London: Royal College of Physicians, 1993. http://www.holtsd.demon.co.uk/pphbrpr1.htm#4

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APPENDIX B: DETAILED ANALYSIS OF RADIATION THERAPY WAITING TIME DATA

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GOALS

The first goal of this analysis was to define and describe important time intervals leading up to radiation therapy for all new cancer patients in Ontario during a defined time period. The chosen time period of calendar years 1999 and 2000 coincides with the operation of the Central Re-referral Office (CRO) and the referral of breast and prostate cancer patients from treatment centres experiencing long delays to other centres, including in the United States, and immediately precedes the establishment of the after-hours clinic in Toronto. Therefore, this time period may be viewed as providing a descriptive baseline against which waiting times in future years may be contrasted. Descriptive data places emphasis on breast and prostate cancer patients - the two largest patient groups experiencing long delays and who have been the subject of re-referral. Also presented is a comparison of observed time to treatment periods within Central Ontario contrasted to the remainder of the province.

The second goal of this analysis was to incorporate patient-related data reflecting the relative urgency of treatment, and to present time to event data for patient subgroups that differ in urgency. For this analysis, characteristics studied, which are indicative of relative urgency, are restricted to the site of the primary diagnosis (without detailed data on histology or clinical features) as well as whether or not the intent of treatment is palliative.

A necessary step in meeting both of these descriptive goals was to examine the available data elements, from Cancer Care Ontario (CCO) and Princess Margaret Hospital (PMH), which describe clinical activity and patient characteristics. Therefore, an integral part of this analysis was consultation with the staff of the specialty cancer hospitals that understand and use the clinical databases that ICES was permitted to access. Included in this report is a summary of the data elements provided and their interpretation. Cross-validation of data elements against external sources was also performed (to the extent possible). Finally, it was necessary to decide and state when it would be fair and appropriate to combine data from CCO's regional cancer centres and PMH for the purpose of producing province-wide findings. No data here are presented for any one individual cancer centre on its own. Therefore, where it was not felt that PMH and CCO data could be combined, PMH data are excluded and not presented separately.

METHODOLOGY

Study Population and Data Sources

This analysis is based on combined data from three distinct sources; activity-level electronic clinical records data from all of the Ontario Regional Cancer Centres (RCCs) operated by Cancer Care Ontario (CCO); similar clinical data from the Princess Margaret Hospital (PMH); and health care administrative data from the Ontario Ministry of Health and Long Term Care (MOHLTC) used for research purposes at ICES.

For this analysis, it was requested that CCO and PMH each provide anonymous and complete electronic records for all patients receiving radiation therapy (RT) in the respective centres at any time during calendar years 1999 and 2000, regardless of whether the patients were new, ongoing cases, or returning cases (see case-processing, below).

Requested patient records were to include Ontario Health Insurance Number (OHIN), ICD diagnosis and all of the dates of activity relevant to waiting times to radiation therapy. Dates requested consisted of dates of referral, request for consult or treatment and /or registration with oncology, the date of clinical consultations or assessments by a radiation oncologist, and the dates of planning, simulation and delivery of RT. Table 1 provides a summary of data from the two sources with reference to the requested information.

Data provided by CCO originated with the Oncology Patient Information System (OPIS) at all eight regional cancer centres (RCC), and reflects all data elements defined by CCO as formulating the minimum common dataset across these centres. Data provided did not include additional fields (many of which were directly relevant to this analysis) which are captured at some or all RCCs but which don't necessarily follow common, province-wide, definitions.

CCO provided ICES with all records for patients as requested in raw and aggregated form (multiple records per case) reflecting all RT activity (e.g. all consultation dates appeared in the data along with derived information for the first such date). For all patients in this selection, CCO also provided a complete history of treatment within CCO centres. Summary data fields created from CCO data include diagnosis, date of registration, date of first RT consultation, date of first simulation or planning, and date of first RT treatment. For selected disease sites, a derived variable was created to reflect whether or not treatment was palliative in nature. Palliative therapy was derived from two indicators: irradiation of a body region removed from the site of the primary tissue, and 10 or fewer fractions delivered to that body region.

Data provided by PMH were structured as one record per case with summary date fields and without a comprehensive patient history. PMH data did include a field for treatment intent. Because of the lack of detailed data on treatment fractions in PMH data, it was not possible to study if the intent of treatment documented in PMH data would have agreed with the algorithm used to identify palliative intent used for the CCO data.

Both clinical databases were linked to the Registered Persons Data Base (RPDB) (an MOHLTC data file describing the health insurance eligible population) at ICES. Only records with a valid OHIN were included in the analysis. Mismatches may reflect typographic errors at the cancer centre or errors in the RPDB. Chemotherapy data and dates of treatment were incorporated into both patient

databases by matching physician billing records for administration of IV chemotherapy to patient records on the basis of OHIN and dates.

For selected diagnoses, surgical records were incorporated from inpatient and outpatient hospital data from the Canadian Institute for Health Information, again by matching OHIN and date ranges. Relevant surgical resection records were defined based on ICD diagnostic codes for the same primary cancer, and procedure codes that reflect surgical incision and resection at the site of the primary including loco-regional lymph node dissection. Only surgical records appearing within 12 months prior to the start of the start of RT were used. Where more than one resection date was noted, the latter was retained.

For both sources, the stated or derived date of first the RT consultation/assessment was compared with external data. Physician services billing records were searched for RT consultations and assessments that matched the OHIN for CCO and PMH patients. It was concluded that the date of first consultation was reliably reported by the cancer centres. It was not possible to validate start of treatment, as billings are not made directly to OHIP.

Data Validation and Case Processing

As shown in Table 1, CCO records pertain to individual cases of cancer where a case is a unique combination of an individual patient and (3-digit) ICD diagnosis. Therefore, one person diagnosed with breast cancer and subsequently with colon cancer would be treated as two cases, whereas a person with two distinct breast cancers would be treated as a single case. Because registration of a case occurs only once, patient data from CCO was only examined up to the start of the first episode of RT following registration of the case. While it would be possible to estimate multiple distinct episodes of care per case, the methods to do this from electronic data have not been validated. The analysis was also restricted to patients registered at any regional cancer centre for only one cancer diagnosis. Returning patients may follow a distinct pathway with respect to referral, for example a first consultation for the new diagnosis might happen at a follow-up visit for the original diagnosis. The simpler definition of new case type reduces complexity and more closely approximates a prospectively registered series of new cases, and provides greater comparability with PMH data.

Cancer Care Ontario data pertained to 34,259 unique cases receiving RT at any time during 1999 and 2000 (Table 2). Among these there were 33,179 individual people with a single cancer diagnosis and validated OHIP number to ensure linkage to external data sources. After exclusion of returning and continuing RT patients, the cohort was reduced to 25,703 patients with complete RT consultation and RT treatment start data. This group then formed the basis of further analysis of times to consultation and treatment. Table 3 presents a summary of the number of CCO patients in the analysis dataset by disease site and intent of treatment as defined above.

PMH data pertained to 9,169 unique individuals receiving RT at any time during 1999 and 2000, several of whom had more than one unique course of treatment, or treatment for more than one diagnosis (Table 4). As was done with the CCO data, a subset of records was selected including those with a valid OHIN, complete consultation data, and receiving a first episode of RT for that individual within 12 months of the reported request date for RT consultation pertaining to the same diagnosis. This subset of 6,434 cases forms the basis of subsequent analysis of PMH data, based on new, first time RT treated patients. Table 5 presents the numbers of patients in this cohort by diagnosis and treatment intent.

Timelines

This project was approved by MOHLTC on November 20, 2000, and ethical review by Sunnybrook and Women's College Hospital was completed on December 4, 2000. In all, it took ten months from the first request for all data to arrive at ICES. Reasons for delay were multifactorial. Several months were needed to address privacy concerns and data sharing under existing legislation. There were also delays in processing data at CCO and PMH where staff is not ordinarily responsible for releasing data to outside researchers. The project also came at a time of heavy workload due to the Cancer Services Restructuring Committee[1] and other processes.

Due to the delay and other considerations, the project team did not conduct the extensive chart abstraction originally proposed. Instead, a project with very similar goals is being undertaken with research grant funding from the National Cancer Institute of Canada. Dr. Veronique Benk as the principal investigator.

RESULTS

Breast Cancer

Table 6 presents the number of breast cancer patients starting RT in CCO centres only, classified according to inferred intent of treatment and nature of multi-modality treatment observed. Only those breast cancer patients with evidence of surgical resection within a year prior to the start of RT are carried forward to the analysis of times to treatment. Some 2,677 patients did not receive chemotherapy between the date of resection and start of RT, while 2,020 had at least one course of chemotherapy starting after surgical resection and prior to RT. Time-to-event data for these two groups are presented separately in Tables 7 and 8 discussed below. Of this select group of breast cancer patients, 387 received a first-ever course of RT with palliative intent. As stated above, other cases receiving palliative care as a second or subsequent course of RT are not included in the time-to-event analysis.

Tables 7 and 8 present time lapsed between important clinical events for the two major subgroups of breast cancer patients receiving adjuvant (RT following surgery). Table 7 presents data for patients receiving adjuvant RT without intervening chemotherapy. The majority of these patients (91 percent) were registered at the regional cancer centre at some point after their initial resection, and of these the median number of days following surgery was 20. Following registration, the median number of days to the first RT consultation was 28 days; followed by a median of 23 days from first consultation or assessment to the start of treatment. Overall, the median time from registration to the start of radiation therapy was 59 days. Ignoring the dates of registration, the total number of days from the most recent surgery to the first RT consultation for breast cancer patients treated in all RCCs was 54 days or almost 8 weeks. The overall median time from surgery to the start of adjuvant RT was 81 days. Only 10 percent started treatment before 49 days and 25 percent by 62 days.

Table 8 presents time to treatment data for the homogeneous group of breast cancer patients receiving both IV chemotherapy and RT post-resection and starting these treatments in this sequence.

The top portion of the table presents the point in the process at which registration at the RCC occurred, as this is the earliest time that a consultation could be received. As before, roughly 90 percent of patients were registered at a cancer centre after surgery at a median time of 20 days later. Eighty percent were registered prior to the observed start of chemotherapy, and four percent had completed chemotherapy prior to being registered at a regional cancer centre. As would be expected, all of the same time intervals presented in Table 7 were longer in these patients; this must be attributable, in part, to time on chemotherapy. Here the median number of days from registration to a first RT consult was 57 days and from first consultation to start of treatment 61 days. The overall time from surgery to first consultation, ignoring chemotherapy, was 98 days and the median days from surgery to the start of RT was 189 days, or 27 weeks; only 10 percent had started RT within 17 weeks.

The bottom portion of Table 8 presents time-to-event data for intervening chemotherapy. Half of patients receiving adjuvant chemotherapy followed by RT started chemotherapy within 42 days. A median of 36 days lapsed between the last observed administration of chemotherapy and the start of RT. Women who received both chemotherapy and RT following surgery started

chemotherapy (their first form of adjuvant care) sooner than those receiving RT alone started adjuvant treatment (42 days as opposed to 54 days).

Table 9 extends the analysis to all of Ontario by combining PMH data with CCO data for selected intervals presented in Tables 7 and 8. Overall the data were quite similar to those shown for all regional cancer centres, but excluding PMH, despite the large size of the PMH patient population. For each of the six time intervals presented in Table 9, the median number of days for the province as a whole was within 7 days of the median calculated on RCC patients alone.

Marked differences are seen when the three specialized cancer centres in the Toronto-Hamilton area in south-central Ontario (Hamilton Regional Cancer Centre, Toronto-Sunnybrook Regional Cancer Centre and Princess Margaret Hospital) are compared with data from the remainder of the Province (Windsor, London, Kingston, Ottawa, Thunder Bay and Sudbury regional cancer centres) (see Table 10). For resected breast cancer patients receiving adjuvant RT without chemotherapy, the median number of days from surgery to RT consultation was 78 days in Toronto and Hamilton, compared with 46 days elsewhere. The total median number of days from surgery to start of adjuvant RT was 105 days vs. 73 days.

For the patient group receiving surgery then chemotherapy and RT, the median number of days from surgery to the start of chemotherapy was the same for both geographic strata (median times of 42 and 43 days), although the duration of chemotherapy treatment between surgery and RT was modestly longer in the greater Toronto area. The median number of days from surgery a first RT consultation was twice as long in Toronto and Hamilton than it was elsewhere (133 vs. 62 days, respectively), while the overall number of days from surgery, through chemotherapy to the start of RT was not markedly different (median of 202 days in Hamilton-Toronto, versus 187 days elsewhere).

Prostate Cancer

In all regional cancer centres, a total of 3,460 records were identified representing men with a first cancer diagnosis of prostate cancer who started their first episode of RT within 1999 and 2000 and had complete registration and health insurance data (see Table 11). PMH data are not included in Tables 11 and 12. Of these, 2,779 (80.3%) were treated with curative intent, while the remaining 681 patients (19.7%) were judged to have palliative radiotherapy based on the algorithm discussed above. The majority of these men (2,451 individuals) had no record of undergoing a surgical procedure. Another 233 had surgery followed by RT within 12 months.

Table 12 shows times from registration to treatment for non-palliative RT in the homogeneous group of 2,411 men who received non-palliative RT for their prostate cancer without chemotherapy or surgery. The median time from registration to the first RT consultation was 27 days with an addition median time of 57 days from first consult to the start of treatment. Overall registration to treatment took 99 days for 50% of these patients. These data do not account for hormonal systemic therapy, which may have been started prior to registration, for these men, or at any point prior to the start of RT.

Other Disease Sites

Table 13 presents three time-to-event intervals for a series of seven cancer diagnostic groupings; breast, prostate, colorectal (primarily rectal), uterine, lung, cervical and head and neck cancers. All

cases were selected, as above, as those starting a first ever episode of RT within the two years under study, within any Regional Cancer Centre (PMH excluded), with complete registration data, and where RT started within a year of cancer centre registration. Patients in these smaller groupings were otherwise included regardless of observed evidence of surgical resection and chemotherapy, although all were assessed to have received non-palliative RT using the same basic algorithm described above. Table 13 presents median number of days, as well as the 25th and 75th percentiles for: the number of days from registration to first RT consultation; from consultation to treatment start; and overall time from centre registration (non-specific to RT) to the earliest RT.

Study of Table 13 shows variability in the median number of days lapsed between RT therapy events by diagnosis. As shown above, the longest interval times are seen in breast and prostate cancer. In 1,040 colorectal cancer patients treated with curative intent, median waiting time from registration to RT was 69 days (range 28–118 days), while for those 311 patients treated palliatively, the median waiting time was 40 days (range 23–64 days). These data show that of 341 cervical cancer patients treated with curative intent, the median waiting time from registration to RT was 23 days (range 14–35 days). Median waiting times for 611 head and neck cancer patients treated with curative intent was 42 days (range 32–49 days), while those treated with palliative intent (84 patients) had a median wait of 33 days (range 15–85 days). Median waiting time for 1,527 lung cancer patients treated with curative intent was 32 days (range 16–53 days). The data shows that in 404 uterine cancer patients treated with curative intent, median waiting time from registration to RT was 27 days (range 19–41 days).

Palliative vs. Non-palliative Therapy

Table 14 displays the distribution in the observed number of days passed between registration and treatment activities for breast and prostate patients, contrasting event times for palliative versus non-palliative cases. Median times were consistently shorter for palliative patients relative to non-palliative patients, although the overall range of times to treatment start was generally wider for palliative patients. This variability likely reflecting the fact that some patients with advanced disease may have developed indications for palliative RT during the weeks following registration or the first RT consult.

DISCUSSION

Arguably, the interests of the MOHLTC in initiating this study were twofold. The first goal was to obtain objective descriptive data on how long patients in Ontario have been waiting for RT, including a centre by centre comparison of waiting times. The second goal was to demonstrate how waiting times might be reported prospectively by the centres providing this care.

Toward the first goal, a true waiting time should start only when a patient has been referred to radiation oncology and is otherwise ready to receive treatment. At a minimum, this should be a point when primary responsibility rests with the cancer centre to get the patient ready for treatment and start. This might include needed investigations but should also take into consideration delays arising with the patient or clinical circumstances, such as recovery from surgery or chemotherapy. Correctly defined, such an indicator of waiting time would provide a fair reflection of the centre's ability to provide care in a timely manner. Correctly defined as well, it is reasonable to expect centres to report these data routinely. While this can be said simply from the standpoint of account-ability, the benefit would be in advocating for system changes and expansion of capacity to shorten waiting times, as well as to evaluate the impact of such interventions.

This study first investigated whether existing data could be used to describe true waiting times and to make comparisons from centre to centre. It was concluded that the latter cannot be done effectively with existing data (see Table 1). The two tertiary referral organizations providing cancer care (PMH and the regional cancer centres operated by CCO) both manage and document referral too differently for direct comparisons to be made. Even within the standardized data system of CCO centres (as was in use at the time of the study), case registration was not specific to RT or to each episode of care, and does not fully satisfy the data requirements needed to assess waiting times. As well, neither PMH nor CCO were able to provide the investigators (or use themselves in the form of pre-collected electronic data) with the clinical information needed to determine when the earliest moment was that the patient was truly eligible to start planning and therapy.

ICES is not the first group to report and comment the need for new or modified data systems to monitor oncology care. CCO, PMH and MOHLTC have already identified the same limitations to existing data systems and have undertaken to change data systems to meet these needs.

Although this analysis is population-based, the investigators were unable to describe, based on the data, waiting times for all patients referred for RT. Instead, it was necessary to first define relatively homogenous subgroups of patients that approximated consecutive case series of new patients. Included in the defined subgroup were all patients with a first-ever referral for radiation oncology for any form of cancer. Of necessity, the cohort is based on patients who started actual therapy within a two year period, as opposed to being all those referred for treatment in a defined period. Therefore, the numbers of patients that have been included in the analysis does not necessarily reflect total numbers of new patients seen in the centres in the two-year period. Nonetheless, it is believed that the reported data provide a reasonable indication of typical waiting times for important patient subgroups as defined.

Breast and prostate cancer patients receiving RT with curative intent, are the two patient groups who have experienced the longest delays, and been the subject of re-referral and other interventions to alleviate waiting times. Selective use of data from CCO provides a look at what

typical waiting times have been for these patients and are consistent with other reports indicating that waiting times were unsatisfactorily long during this time period. For breast cancer patients, it has been recognized that waiting times should take into account time when the patient is ineligible for RT due to IV chemotherapy received at or outside the cancer centre. This is the first Ontario report to take this into account. From available data it would appear, even for resected breast cancer patients receiving RT at a RCC without IV chemotherapy, only 23% had a first consultation within two weeks of referral and registration to the centre, and 62% of patients starting RT did so within four weeks of their first consultation or assessment. That only 15% of these patients had a first consult within four weeks of surgery in part also reflects delays in referral to the RCC after surgery (data not shown).

A conclusion that cannot be made from our analysis is that the CCO radiation oncology clinics are failing to meet the recommendations of the Canadian Association of Radiation Oncologists that all patients receive consultation within two weeks of referral and treatment within four. In these analyses, indications for RT may not be known at the moment of registration with the centre, and an opinion about the appropriateness of RT may have been received without a formal billing being recorded (such as through a surgical oncologist outside the centre).

Time spent waiting for treatment within the oncology system is but one aspect of timeliness of care. More important is to ensure that all patients start and complete appropriate cancer therapy within a reasonable period of time relative to the start of clinical management. What is 'reasonable' remains to be defined in terms of maximizing clinical benefit, and limiting strain on patients and care providers.

This report also looked at time to therapy from surgical resection, for applicable cases, regardless of when the referral for RT took place. Importantly, these data are based on data collected in a comparable way for all cancer patients, and so descriptive findings can be reported for all Ontario patients including those of PMH. Results were indeed discouraging. For breast cancer patients receiving RT without chemotherapy as adjuvant therapy, half waited longer than seven weeks for a consult and, in total, the median time from surgery to the start of adjuvant RT was three months.

In terms of the management of radiation oncology in the province, these data indicate that times to treatment are not homogeneous for all cancer patients or all centres. A contrast of the three centres in the Toronto and Hamilton area with the rest of the province confirmed differences known to exist, with relatively longer waits happening in or near Toronto. However, regional differences observed were limited to the times from registration to consultation, and were not apparent in overall times from either surgery or registration to the start of actual therapy. It should be recalled that the time period under study corresponded with a period in which patients waiting the longest were being re-referred to centres with lower case volume, and redirected to treatment centres in neighbouring US States. These efforts undoubtedly resulted in a truncation of the distribution of waiting times for prostate and adjuvant breast patients who were treated in the province, and therefore appear in the data analysed here.

Patients are not treated equally with respect to apparent urgency. The long waiting times, noted above, for adjuvant treatment in breast cancer and prostate cancer care were not unexpected. Shorter waiting times were observed for cervical cancer and head and neck cancers, with median times from registration to consultation being in the order of one week, as opposed to nearly one month. Cervical cancer patients had a median time from registration to the start of treatment that was more than three weeks shorter than RT for breast cancer following resection alone. Different waiting times reflect the different role RT plays in treating these distinct diseases. Use of RT as adjuvant therapy in breast cancer, in patients without evidence of residual disease following

resection, may reasonably be viewed as less urgent than a disease in which RT is used as the primary curative modality, or where RT is used prior to resection, which should happen as quickly as possible to reduce the likelihood of progression and spreading.

Similarly, within breast and prostate cancer groups, the wait times were markedly shorter when the intent of treatment was palliative as opposed to non-palliative. Currently, there exists no standardized province-wide schema in place to assign urgency to RT patients. In addition, several centres make explicit reference to relative urgency in scheduling clinic time. However, all Ontario centres have procedures in place to treat patients in urgent need of therapy within hours to days. The most common examples of urgent cases include pending cord compression or fracture as seen in palliative cases.

Should a queue management system be established for radiation oncology in Ontario? In Canada, supply outstrips demand for many diagnostic and therapeutic services. Long waits often result. Several services have been the focus of formal queue management programs[2-5] of which common elements are open and fair case registration, priority ranking, and reporting of current waiting times by centre. The goals are to ensure that patients in greatest need are seen first, and that waiting times are acceptable for all patients who will benefit. Queue management may also imply an element of rationing, in that patients unlikely to benefit may continue to wait.

There are similarities and dissimilarities between radiation therapy and other medical or surgical services addressed by queue management. Many such programs have dealt with patients whose state might be described as stable discomfort, including waiting for hip and knee replacement, imaging for soft-tissue injuries or even cardiac bypass for stable angina. Patients with progressing disease may be reclassified as more urgent (as is the case with the Cardiac Care Network system in Ontario). Radiation oncology is not easily viewed as an issue of chronic disease management, or aimed at disease processes in steady state. Long waits for RT are seen primarily in the most common disease sites, breast and prostate cancer, where clinical practice guidelines exist to document the appropriateness of the care and benefit to patients in reducing the likelihood of local disease recurrence and progression, and demonstrated benefit in patient survival. Therefore triage, or reduction of inappropriate use, is not going to be a major consideration, or goal, in proposing waiting time management in RT.[6-9] This is particularly true in some uses of RT in palliative care, which may already be treated as urgent and there exists a large unmet demand.

Reporting alone will do little to reduce waiting times. Unlike many other services subjected to queue management programs, patients cannot readily be redirected to another local centre with a shorter waiting time, as most regions have only one centre with the physical plant and technology to deliver RT.

The most obvious immediate benefits of a formal queue monitoring system in radiation oncology to the institutions delivering care would be administrative and political. Objective data on current waiting times lends political clout and would provide a clear basis against which to evaluate efforts to increase capacity against real-time change in waiting times. It would also demonstrate commitment to monitoring and managing services to maximize efficiency.

Benefits to patients and the public health care system include increased transparency and possibly, fairness in access. Without a formal queue management system, one cannot be certain that there does not exist a rationing-by-waiting system whereby some patient subgroups might be unfairly disadvantaged in receiving RT. This issue is not addressed in this report. This analysis excludes patients never referred for consultation with radiation oncology; refused or discouraged from obtaining a referral (regional cancer centres are required to accept referrals with proper

documentation) or who, for whatever reason, did not start RT within a year of registration. Reporting of RT waiting times should be done separately for different types of cancer patients because this is important to making sense of the data.

To provide these objective data, a formal waiting time or queue management system, including case registration, priority assignment and real-time reporting of waiting times by institution, should be seen as a priority but never merely as a goal in and of itself. The goal would not be to drive waiting times down to the absolute minimum but to ensure that all patients who will benefit are treated in a reasonable timeframe. What is 'reasonable' must be defined with reference to disease processes, and the circumstances of the individual patient, including his or her physical well-being and recovery from other therapy, and the tolerance or preference of the patient to wait.

RECOMMENDATIONS

The following is recommended for future monitoring:

1. Common definitions should be established to define time spent waiting for care within the radiation oncology system.

    a) These waiting times should be validated and reported on an ongoing basis.

    b) Reporting and using waiting times within the radiation oncology system should take into account time when the patient is not immediately eligible for treatment due to clinical circumstances or waiting for services not under the control of the department of radiation oncology.

2. Waiting times should be presented separately for patient groups that are distinct with respect to relative urgency,

    a) Radiation oncology centres would be encouraged to define and use common definitions of relative urgency, to clarify and simply reporting and monitoring of the performance of the system.

    b) At a minimum, data should be presented by patient subgroups that can be easily reproduced across centres (such as by diagnosis, stage of disease, treatment intent and other forms of therapy received).

3. Waiting times should also be reported in ways which reflect complete processes of care as appropriate for major patient groupings, rather than just within radiation oncology departments. Examples include times from surgery to referral for adjuvant therapy, not just time from referral to treatment.

4. There should be greater opportunities for data sharing across institutions such that data on all modalities of therapy can be considered, as well as more detailed information about the patient.

TABLES

TABLE B.1. Summary of elements in data sets from Cancer Care Ontario and Princess Margaret Hospital.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Date of registration	Date of registration at CCO is, in most cases, captured objectively from a standardized referral process. Date is specific to each diagnosis per patient although variations may occur. Registration is not unique per tumour of same type (ICD); not unique to RT nor to distinct episode of care (such as initial treatment and re-treatment at the time of progression or recurrence).	Date of registration is specific to the host hospital (UHN) rather than to oncology (see date of referral below).	Data across institutions are not viewed as comparable.	Data from both sources are valid for their uses within individual institutions, and relevant to this analysis. However dates are not comparable across centres. Neither adequately reflects true patient eligibility for RT, nor start time for radiation therapy queue. In either case, the date of referral or request relative to readiness for radiation therapy is not under the control of the cancer centre, may be influenced by external factors, and may not reflect when the patient is ready to receive RT.
Date of request	See date of registration. A small number of patients have a date of referral distinct from registration date.	Date of request for RT consultation. This may or not be in close proximity to the first contact with PMH and/or UHN. Data, when present, are considered to be valid and relevant. Data not available for all patients, depending on mechanism of referral.	Data across institutions are not viewed as comparable.	
Date of diagnosis	This date in records provided was completed by clinical staff and the definition used may vary. See comments.	This date in records provided was completed by clinical staff and the definition used may vary. See comments.	Not used in analysis. See comments	Valid date of diagnosis is captured through the Ontario Cancer Registry with standard definitions for all Ontario patients. Linked registry data were not available for this study.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Date of initial assessment (RT consultation)	Date of first radiation therapy consultation. Objectively defined and administratively captured. Accuracy of date established through comparison with external sources (OHIP billing records).	Date of first radiation therapy consultation. Objectively defined and administratively captured. Accuracy of date established through comparison with external sources (OHIP billing records).	At face value, data are valid and comparable, but (1) structure of data varies. CCO data reflect first episode of care for that diagnosis whereas PMH data reflect each episode of care, including several for the same diagnosis; and (2) institutional policies vary.	For this analysis, comparability between sources was created by taking only the first episode of care per diagnosis, and only first diagnosis per patient. It is recommended that centres capture unique process data for each distinct episode of care.
Date of decision to use radiation	Not captured. No obvious consensus as to definition of date of decision to treat or use.	Not captured electronically. No obvious consensus as to definition of date of decision to treat or use.	Lack of data.	A standardized definition is needed before prospective data could be considered.
Date of decision how to treat	Date of the first simulation (SIM).	Date of the first simulation (SIM).	Objective and comparable data.	Start of SIM is captured reliably. However, SIM may be postponed until just prior to treatment. Analysis here focused instead on start of actual therapy.
Earliest date at which patient is ready to start RT	Not available.	Not available.	Lack of data.	This is an important but complex construct. Earliest readiness for treatment would need a common definition based on completion of staging, other therapy, planning and functional status.
Dates of first and last RT treatment	Objectively defined and administratively captured.	Objectively defined and administratively captured.	Reliable, comparable data. See comments.	Valid, comparable data. However, start of treatment may reflect queue and clinical circumstances not captured in available data.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Intent to treat	Not available. Used in all centres but without standardized definition. Palliative treatment intent was derived using validated algorithms based on fractionation and body region irradiated.	Captured in electronic data from self-report by clinical staff. However, definitions and means of capture are not standardized.	Data elements are not identical, but considered sufficiently close, and important, to permit use of data from two sources to be used together, in a limited way, for selected diagnoses.	It is recommended that intent of treatment for each episode of care be captured using common definitions.
Site of treatment	Available. Derived from ICD-9 codes. Data reported by clinical staff.	Available. Derived from ICD-9 codes. Data reported by clinical staff.	Data capture not identical but reasonable for comparison.	Validation against OCR and detailed records should be incorporated in future analyses.
Disease stage	Stage is typically available to clinical staff. Electronic data provided include a data table with disease stage; however, stage is not part of minimum standard. (Province-wide) data set and definition used may vary. Data provided may not reflect stage at start of RT.	Stage data exist in clinical records but not provided in electronic data.	Not used. Treatment intent was used as a partial proxy for disease stage at start of RT.	Recommendations to include disease stage in all clinical data have been made by PMH, CCO and MOHLTC.
Treatment dose	Provided in clinical data, but not used.	Not provided in electronic data.	Not used.	Not critical.
Date of surgery	Date of the latest surgical procedure aimed at the primary cancer before the start of RT; derived from CIHI (1997-99) and from OHIP (2000).	Date of the latest surgical procedure aimed at the primary cancer before the start of RT; derived from CIHI (1997-99) and from OHIP (2000).	Comparable data incorporated from external source.	Objective data are important for resected cases. However, date of definitive resection assigned from hospital records may not be most important date clinically or for queue monitoring.

Element	Cancer Care Ontario	Princess Margaret Hospital	Comparison	Comments for Future Improvements
Date of first and last chemo-therapy (CT)	Detailed activity level data on CT delivered within that centre are part of centre records; CT outside centre requires separate data sources. CT data incorpor-ated via record linkage to OHIP billing records.	Detailed activity level data on CT delivered within that centre are part of centre records; CT out-side centre requires separate data sources. CT data incorpor-ated via record linkage to OHIP billing records.	Centre CT data not used. Comparable dates derived from external source for both data sources.	Complete and consistent data on IV chemo-therapy, regardless of where received, should be part of prospective radiation therapy queue monitoring. This should complete data on oral agents as well. (Not incorporated here).
History of previous RT (before 1999 – used for exclusion)	RT treatment history was pro-vided by CCO and validated against radiation therapy consultation billing records for 1991 through 1998.	PMH provided data for new patients without complete history. History of radiation therapy incorporated from linkage to OHIP billing records.	Data structures not identical, but external data provided basis for creation of com-parable 'new patient' case series.	Should be captured by all institutions in a uniform manner.

TABLE B.2. Case selection and processing – Cancer Care Ontario regional cancer centres. Selection of case records to simulate a consecutive case series of new patients starting first episode of RT between January 1, 1999, and December 31, 2000.

	n
Number of unique cases (unique combination of patient identifier and primary cancer diagnosis, registered and receiving RT in 1999/2000)	34,259
Number of patients with a single primary cancer diagnosis	33,759
Number of patients with a single primary cancer diagnosis and with verified OHIP number[2]	33,179
▪ Patients with no registration information	7
▪ Returning/continuing RT therapy patients[1]	4,639
▪ Patients starting first RT therapy in 1999-2000[2]	28,533
▪ Patients treated within 1 year of registration at a regional cancer centre[3]	25,988
- with one or more consultation records before RT	**25,703**
- with no consultation record before RT	285

[1] Returning/continuing RT therapy patients = patients who had been treated or started treatment at a regional cancer centre prior to January 1, 1999.
[2] This analysis is restricted to a single episode of care per patient.
[3] Registration = registration date at the regional cancer centre for the primary disease.

TABLE B.3. Summary of patients in analysis by diagnosis and treatment type, Ontario regional cancer centres. Numbers of new radiation therapy patients[1] receiving first episode of RT in Ontario regional cancer centres starting 1999 and 2000 by selected disease sites (ICD diagnosis) and derived type of treatment (palliative or non-palliative intent[2]). (N=25,703).

Site	RT Intent[1]	n (%)
Breast cancer		5,539 (21.6)
	Non-palliative	5,152
	Palliative	387
Cervix cancer		368 (1.4)
	Non-palliative	341
	Palliative	27
Colorectal cancer		1,351 (5.3)
	Non-palliative	1,040
	Palliative	311
Head and neck cancer		695 (2.7)
	Non-palliative	611
	Palliative	84
Lung cancer		4,073 (15.8)
	Non-palliative	1,527
	Palliative	2,546
Prostate cancer		3,460 (13.5)
	Non-palliative	2,779
	Palliative	681
Uterine cancer		479 (1.9)
	Non-palliative	404
	Palliative	75
Other cancers		9,738 (37.9)
Total of selected sites		15,965 (62.1)
(named above, excludes	Non-palliative	11,854
Other cancers)	Palliative	4,111

[1] Patients with valid OHIP number and registration data, commencing first radiation therapy for any registered cancer primary within a regional cancer centre between January 1, 1999, and December 31, 2000, and starting within one year of registration at the centre.
[2] Palliative intent was inferred using an algorithm based on body region code indicated and number of fractions; remaining cases were judged to have non-palliative intent.

TABLE B.4. Case selection and processing, Princess Margaret Hospital (PMH). Selection of case records to simulate a consecutive case series of new radiotherapy patients starting first episode of RT between January 1, 1999, and December 31, 2000.

	n
Number of treatments; unique combinations of patient identifier and treatment record[1]	11,712
1st treatment observed	9,169
2nd+ treatments observed	2,543
Number of unique patients receiving treatment in period with a single diagnosis	9,169
Number of patients with only one primary and a valid OHIP number	8,950
Patients with no request information[2]	496
Returning/continuing[3] RT therapy patients (at least 1 RT consultation from OHIP <1999)	1,763
Patients starting first RT consultation[4] in 1999-2000 (no RT consultation from OHIP <1999)	6,691
Treated within 1 year of request	6,590
- with one or more consultation records before RT	**6,434**
- with one or more consultation records after RT	50
- with no consultation records	106

[1] Unique "patient-treatment" combinations = a record of a person (unique ICES key number or encrypted OHIP number) with valid cancer (primary) treatment information. A person can have multiple records for the same primary. Each occurrence is counted as one combination.
[2] Request = date of the referral to the PMH for the first radiation therapy consultation (internal or external). This may or not be in close proximity to the first contact with PMH and/or UHN. No request data means there was no information about the date of request (referral to the PMH).
[3] Patients who have been treated or started the treatment at the cancer centre prior to the January 1, 1999 (our start date) based on the OHIP data (fees for radio-oncology consultations).
[4] Patients with no evidence of a prior RT consultation from OHIP records.

TABLE B.5. Summary of patients in analysis by diagnosis and treatment type at Princess Margaret Hospital. Number of patients[1] receiving first episode of RT starting 1999 and 2000 by selected disease sites (ICD diagnosis) and intent of treatment (N=6434).

Site	RT Intent[1]	n (%)	
Breast cancer		909	(14.1)
	Non-palliative	755	
	Palliative	100	
	Radical, RT not planned/not given or missing	54	
Cervix cancer		114	(1.8)
	Non-palliative	84	
	Palliative	17	
	Radical, RT not planned/not given or missing	13	
Colorectal cancer		492	(7.6)
	Non-palliative	334	
	Palliative	102	
	Radical, RT not planned/not given or missing	55	
Head and neck cancer		403	(6.3)
	Non-palliative	347	
	Palliative	39	
	Radical, RT not planned/not given or missing	17	
Lung cancer		730	(11.3)
	Non-palliative	154	
	Palliative	537	
	Radical, RT not planned/not given or missing	39	
Prostate cancer		777	(12.1)
	Non-palliative	539	
	Palliative	66	
	Radical, RT not planned/not given or missing/BMT	172	
Uterine cancer		25	(0.4)
	Non-palliative	20	
	Palliative	<5	
	Radical, RT not planned/not given or missing	<5	
Other cancers		2,977	(46.3)
	Non-palliative	1,497	
	Palliative	1,130	
	Radical, RT not planned/not given or missing/BMT	111	
	RT not planned/not given or missing	239	
Missing		7	(0.1)
All sites (excludes other cancers and missing)		3,450	(53.6)
	Non-palliative	2,233	
	Palliative	863	
	Radical, RT not planned/not given or missing	14	
	RT not planned/not given or missing	340	

[1] Analysis restricted to first episode of RT for any primary commencing within two-year period under study. Original patient records included patients with multiple diagnoses and/or multiple treatments (see Table 3).
[2] Treatment intent was included in original records from PMH. Data are entered by clinical staff.

TABLE B.6. Breast cancer cases[1], all regional cancer centres (Princess Margaret Hospital excluded) by pattern of other therapy observed and treatment intent.[2] Patients starting first RT in Ontario regional cancer centres between January 1, 1999, and December 31, 2000.

INTENT AND TREATMENT PATTERN	n (%)
Breast cancer patients	5,539
Non-palliative	5,152 (93.0)
No record of resection[3] prior to RT	222
Treated more than 12 months following surgical resection	23
Started RT within 12 months following most recent surgical resection	4,907
▪ Surgery followed by radiation without intervening chemotherapy[4]	2,677
▪ Surgery followed by chemotherapy and then radiation	2,020
▪ Chemotherapy commencing prior to surgery	189
Palliative	387 (7.0)

[1] New patients are those with complete data, commencing first radiation therapy for any primary cancer from January 1, 1999, to December 31, 2000, and within 12 months of the first registration at the regional cancer centre (see Table 2).
[2] Non-palliative and Palliative intent inferred from algorithm based on body region code indicated and number of fractions.
[3] Surgical procedures identified from CIHI records. Resections included appropriate surgery directed at the site of the primary.
[4] Chemotherapy data derived from OHIP physician billings records for administration of intravenous chemotherapy. Data do not include oral agents.

TABLE B.7. Breast cancer: non-palliative adjuvant RT without chemotherapy – Cancer Care Ontario centres only. Time lapsed between RT treatment events for non-palliative[1] breast cancer patients, post-surgical RT without intervening start of chemotherapy. New RT patients[2] with breast cancer and non-palliative treatment intent[2] starting therapy regional cancer centres only, in 1999 and 2000. Restricted to patients starting RT within one year of registration and one year of resection.[3] (N=2677, unless otherwise specified).

ELAPSED TIME IN DAYS (percentile)				
10th	**25th**	**50th**	**75th**	**90th**
TIME FROM SURGERY TO REGISTRATION (N=2431)				
8	12	20	37	60
TIME FROM SURGERY TO FIRST RT CONSULTATION				
22	34	54	78	105
TIME FROM SURGERY TO RADIATION				
49	62	81	106	133
TIME FROM REGISTRATION TO FIRST RT CONSULTATION				
10	15	28	48	71
TIME FROM FIRST RT CONSULTATION TO RADIATION				
8	15	23	36	53
TIME FROM REGISTRATION TO RADIATION				
27	41	59	83	109

[1] Non-palliative intent inferred from algorithm based on body region code indicated and a number of fractions.
[2] New patients are those with complete data, commencing first radiation therapy for any primary cancer from January 1, 1999, to December 31, 2000, and within 12 months of the first registration at the regional cancer centre (Table 2).
[3] Surgical procedure aimed at the primary cancer. Excludes patients receiving RT prior to the surgery or >12 months after the surgery.
[4] Restricted to 2,431 patients registered after surgery.

TABLE B.8. Breast cancer: non-palliative adjuvant RT following chemotherapy. Time lapsed between RT treatment events for non-palliative[1] breast cancer patients, receiving post-surgical chemotherapy followed by RT. New RT patients[2] with breast cancer and non-palliative treatment intent[2] starting therapy regional cancer centres only, in 1999 and 2000. Restricted to patients starting RT within one year of registration and one year of resection (N=2020).

EVENT	n (%)
Surgery preceding registration at RCC	1,812 (89.7)
Surgery following registration at RCC	208 (10.3)
Registration before start of chemotherapy	1,599 (79.2)
Registration during chemotherapy	337 (16.7)
Registration after completion of chemotherapy	84 (4.2)
Last chemotherapy observed before radiation	1,700 (84.2)
Last chemotherapy observed after RT start	320 (15.8)

ELAPSED TIME IN DAYS (percentile)				
10th	**25th**	**50th**	**75th**	**90th**
Time from surgery to registration[4] (N=1812)				
7	11	20	38	94
Time from surgery to first RT consultation				
28	51	98	152	201
Time from surgery to radiation				
120	146	189	225	252
Time from registration to first RT consultation				
14	28	57	113	164
Time from first rt consultation to radiation				
16	27	61	126	181
Time from registration to radiation				
64	112	160	204	232
Time from surgery to first chemotherapy				
25	33	42	55	72
Time from last chemotherapy to radiation[5] (N=1700)				
21	28	38	48	64

[1] Non-palliative intent inferred from algorithm based on body region code indicated and a number of fractions.
[2] New patients are those with complete data, commencing first RT for any primary cancer from January 1, 1999, to December 31, 2000, and within 12 months of the first registration at the regional cancer centre. (Table B.2).
[3] Surgical procedure aimed at the primary cancer. Excludes patients receiving RT prior to the surgery or >12 months after the surgery.
[4] Restricted to patients registered after most recent resection.
[5] Excludes patients with one or more courses of chemotherapy occurring after the start of RT.

TABLE B.9. Breast cancer: non-palliative RT for Ontario (all regional cancer centres and Princess Margaret Hospital combined). Time lapsed between RT treatment events for new[1] non-palliative[2] breast cancer patients, starting a post-surgical RT[3] within 12 months of surgery, with and without intervening IV chemotherapy in 1999 and 2000.

ELAPSED TIME IN DAYS (PERCENTILE)				
10th	**25th**	**50th**	**75th**	**90th**
Patients with radiation therapy following resection without intervening chemotherapy (n=2961)				
TIME FROM SURGERY TO FIRST RT CONSULTATION				
23	35	55	83	115
TIME FROM SURGERY TO FIRST RADIATION				
50	62	84	112	144
Patients with post-resection chemotherapy followed by radiation therapy (n=2353)				
TIME FROM SURGERY TO FIRST RT CONSULTATION				
29	53	99	154	207
TIME FROM SURGERY TO FIRST CHEMOTHERAPY				
25	34	42	55	72
TIME FROM FIRST TO LAST CHEMOTHERAPY				
63	68	143	154	171
TIME FROM SURGERY TO FIRST RADIATION				
119	146	194	229	257

[1] New patients are those with complete data, commencing first radiation therapy for any primary cancer from January 1, 1999, to December 31, 2000, and within 12 months of the first registration at the regional cancer centre. (Table B.2).
[2] Non-palliative intent for regional cancer centres inferred from algorithm based on body region code indicated and a number of fractions. Intent coded by clinical staff at Princess Margaret Hospital.
[3] Surgical procedure aimed at the primary cancer. Excludes patients receiving RT prior to the surgery or >12 months after the surgery.

TABLE B.10. Regional differences in time to treatment for adjuvant breast cancer therapy involving RT, with and without intervening adjuvant IV chemotherapy. New non-palliative breast cancer patients starting RT in 1999 and 2000 within 1 year of resection in all regional cancer centres and Princess Margaret Hospital combined. Central Ontario (Toronto and Hamilton) versus the remainder of the province.

ELAPSED TIME IN DAYS (PERCENTILE)				
10th	**25th**	**50th**	**75th**	**90th**
Patients with RT following resection, without intervening chemotherapy				
Central Ontario (Toronto-Sunnybrook & Hamilton RCCs and PMH; N=1112)				
TIME FROM SURGERY TO FIRST RT CONSULTATION				
34	50	78	106	144
TIME FROM SURGERY TO FIRST RADIATION				
60	79	105	134	164
Remainder of Ontario (N=1849)				
TIME FROM SURGERY TO FIRST RT CONSULTATION				
20	30	46	68	86
TIME FROM SURGERY TO FIRST RADIATION				
48	57	73	96	119
Patients with post-resection chemotherapy, followed by RT				
Central Ontario (Toronto-Sunnybrook & Hamilton RCCs and PMH; N=1286)				
TIME FROM SURGERY TO FIRST RT CONSULTATION				
49	87	133	183	221
TIME FROM SURGERY TO FIRST CHEMOTHERAPY				
26	34	42	56	74
TIME FROM FIRST TO LAST CHEMOTHERAPY				
63	72	147	155	175
TIME FROM SURGERY TO FIRST RADIATION				
120	148	202	236	263
Remainder of Ontario (N=1067)				
TIME FROM SURGERY TO FIRST RT CONSULTATION				
22	35	62	107	159
TIME FROM SURGERY TO FIRST CHEMOTHERAPY				
24	34	43	55	71
TIME FROM FIRST TO LAST CHEMOTHERAPY				
62	65	114	148	168
TIME FROM SURGERY TO FIRST RADIATION				
117	141	187	222	245

[1] Non-palliative intent for regional cancer centres inferred from algorithm based on body region code indicated and a number of fractions. At Princess Margaret Hospital, intent recorded by clinical staff.
[2] Date of resection from CIHI hospital records. Excludes patients receiving RT before surgery or >12 months following surgery.

TABLE B.11. Prostate cancer: non-palliative RT received in all Ontario regional cancer centres. Numbers of new RT patients with prostate cancer only, by inferred treatment intent and pattern of therapy received. Patients with complete information, starting first RT in regional cancer centres between January 1, 1999, and December 31, 2000, and treated within 1 year of registration with the centre (N=3460).

INTENT AND TREATMENT PATTERN[1]	n (%)
Prostate cancer patients	3,460
▪ **Non-palliative**	2,779 (80.3)
Treated more than 12 months after most recent surgery[2]	95
Had no record of surgery before RT	2,451
– No chemotherapy before RT	**2,411**
– Other	40
Treated within 12 months after most recent surgery	233
Surgery-radiation	233
• **Palliative**	**681** (19.7)

[1] Non-palliative and palliative intent inferred from algorithm based on body region code indicated and a number of fractions.
[2] Surgical procedure aimed at the primary cancer.

TABLE B.12. Prostate cancer: non-palliative RT received in all Ontario regional cancer centres (excludes Princess Margaret Hospital). Time lapsed between registration and the start of RT for non-palliative[1] prostate cancer patients starting first RT, without evidence of IV chemotherapy[2] or surgery, in all Ontario regional cancer centres between January 1, 1999, and December 31, 2000. (N=2411).

WAITING TIME IN DAYS (percentile)				
10th	**25th**	**50th**	**75th**	**90th**
TIME FROM REGISTRATION TO FIRST RT CONSULTATION				
9	15	27	46	73
TIME FROM FIRST RT CONSULTATION TO RADIATION				
19	31	57	98	161
TIME FROM REGISTRATION TO RADIATION				
40	62	99	147	195

[1] Non-palliative intent inferred from algorithm based on body region code indicated and a number of fractions.
[2] Excludes patients receiving IV chemotherapy following treatment; however oral chemotherapy agents were not addressed.

TABLE B.13. Comparative times between RT treatment events for patients of selected disease sites within regional cancer centre data. New patients starting first RT (non-palliative) between January 1, 1999, and December 31, 2000. Patients with complete data and treated within one year of registration at the regional cancer centre.

Patients treated with non-palliative intent[1]	Registration to first RT consultation	First RT consultation to RT start	Total time from registration to first RT
	Time elapsed in days. Median (25th, 75th percentiles)		
Breast cancer			
Surgery[2] – RT (n=2677)	28 (15, 48)	23 (15, 36)	59 (41, 83)
Surgery[2] – start chemotherapy – RT (n=2020)	57 (28, 113)	61 (27, 126)	160 (112, 204)
Prostate cancer			
No surgery – no chemotherapy – RT (n=2411)	27 (15, 46)	57 (31, 98)	99 (62, 147)
Colorectal cancer[3] (n=1040)	22 (12, 33)	40 (23, 64)	69 (48, 92)
Uterine cancer[3] (n=404)	17 (8, 28)	27 (19, 41)	48 (36, 71)
Lung cancer[3] (n=1527)	14 (8, 26)	32 (16, 53)	52 (34, 77)
Cervical cancer[3] (n=341)	8 (5, 18)	23 (14, 35)	36 (26, 48)
Head & neck cancer[3] (n=611)	7 (4, 13)	32 (22, 49)	42 (31, 63)

[1] Non-palliative intent inferred from algorithm based on body region code indicated and a number of fractions.
[2] Surgical procedure aimed at the primary cancer. Excludes patients receiving RT prior to the surgery or >12 months after the surgery.
[3] Includes all patients without reference to chemotherapy or surgery.

TABLE B.14. Patients receiving first palliative[1] RT for breast cancer in Ontario regional cancer centres between January 1, 1999, and December 31, 2000. Patients with valid consultation treated within 1 year of registration (n=387).

WAITING TIME IN DAYS (percentile)				
10th	**25th**	**50th**	**75th**	**90th**
TIME FROM REGISTRATION TO FIRST RT CONSULTATION)				
2	8	16	42	106
TIME FROM FIRST RT CONSULTATION TO RADIATION				
0	0	0	6	14
TIME FROM REGISTRATION TO RADIATION				
5	12	34	86	207

[1] Palliative intent inferred from algorithm based on body region code indicated and a number of fractions.

TABLE B.15. Patients receiving first palliative[1] RT for prostate cancer in Ontario regional cancer centres between January 1, 1999, and December 31, 2000. Patients with valid consultation treated within 1 year of registration (n=681).

WAITING TIME IN DAYS (percentile)				
10th	**25th**	**50th**	**75th**	**90th**
TIME FROM REGISTRATION TO FIRST RT CONSULTATION (N=681)				
2	8	18	36	65
TIME FROM FIRST RT CONSULTATION TO RADIATION (N=681)				
0	0	0	12	41
TIME FROM REGISTRATION TO RADIATION (N=681)				
5	18	52	122	210

[1] Palliative intent inferred from algorithm based on body region code indicated and a number of fractions.

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