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Quality assurance in prostate RT

A criterion-based audit of the technical quality of external beam radiotherapy for prostate cancer

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ABSTRACT

Purpose: To evaluate the technical quality of external beam radiotherapy for prostate cancer in Canada.
Methods: This was a multi-institution, retrospective study of a random sample of patients undergoing radiotherapy (RT) for prostate cancer in Canada. Patterns of care were determined by abstracting details of the patients' management from original records. The quality of patient's technical care was measured against a previously published, comprehensive suite of quality indicators.
Results: 32 of the 37 RT centres participated. The total study population of 810 patients included 25% low-risk, 44% intermediate-risk, and 28% high-risk cases. 649 received external beam RT (EBRT) only, for whom compliance with 12 indicators of the quality of pre-treatment assessment ranged from 56% (sexual function documented) to 96% (staging bone scan obtained in high-risk patients). Compliance with treatment-related indicators ranged from 78% (dose to prostate $\geqslant$74 Gy in intermediate risk patients not receiving hormone therapy) to 100% (3DCRT or IMRT plan). Compliance varied among centres; no centre demonstrated 100% compliance on all indicators and every centre was 100% compliant on at least some indicators. The number of assessment-related indicators ($n = 13$) with which a given centre was 100% compliant ranged from 4 to 11 (median 7) and the number of the treatment-specific indicators ($n = 8$) with which a given centre was 100% compliant ranged from 6 to 8 (median 8). ADT therapy was utilised in most high-risk cases (191, 92.3%).
Conclusions: While patterns of prostate cancer care in Canada vary somewhat, compliance on the majority of quality indicators is very high. However, all centres showed room for improvement on several indicators and few individual patients received care that met target benchmarks on all quality measures. This variation is particularly important for indicators such as delivered dose where impact on disease outcome is known to exist, and suggests that quality improvement programmes have the potential to further improve quality of care.
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Quality of care is an important issue for cancer control services in general, and for radiation oncology services specifically [1–3]. Maximising the benefit of radiotherapy requires that radiation services be of the highest possible quality. Assessment of quality of care allows care providers to examine their clinical performance against established standards of care and allows payers to assess the quality of care they are purchasing [1].

Donabedian [4] initially described a conceptual framework for evaluating quality of medical care, stratifying the assessment of quality into structure, process, and outcome domains, and further distinguishing the quality of interpersonal care from the quality of technical medical care (the extent to which the application of medical science and technology maximises its health benefits without correspondingly increasing its risks") [5]. In the context of radiation oncology [1,3,6] "structure" refers to many types of physical and human resources needed to provide care, "process" refers to elements such as pre-radiotherapy (RT) assessments, planning, and delivery of RT. In order to achieve optimal patient outcomes, it is necessary to identify and correct deficiencies in both structure and process [1,3].

Criterion-based audit provides a well-established mechanism for identifying and correcting such deficiencies [7]. This approach differs in some respects from traditional reviews of clinical practice in that it establishes explicit criteria for quality, involves numerical comparison of current practice against those criteria, allowing

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comparison of practice among peers. This type of audit provides the information necessary to design and implement interventions to enhance the quality of care, and has been used in radiation oncology but not previously in Canada.

All radiotherapy in Canada is delivered at 37 publicly-funded cancer centres. Fig. S1 describes the Canadian radiotherapy system, and illustrates that most patients are treated in relatively large centres. Within this relatively centralised system, we hypothesised it would be feasible to audit the quality of radiotherapy across the nation and to use the results of such audits to inform strategies for quality improvement. We chose prostate cancer as the focus of this first national audit of the quality of radiotherapy in Canada, because of its high incidence [8], the major role which radiotherapy plays in its management [9,10], and its highly complex nature [9], making it particularly important to ensure that its quality is adequate to ensure optimal outcomes.

We developed a suite of indicators of the technical quality of radiotherapy for prostate cancer [2] and now report the results of a Canada-wide audit of the quality of the prostate radiotherapy measured against this suite of indictors. The long-term goal of this work is to enhance the outcomes of prostate radiotherapy in Canada by identifying opportunities for improving the quality of treatment that will inform the development of a national programme of quality improvement [3]. The immediate objectives of the present study were to:

(a) Determine the feasibility of conducting a criterion-based audit of the technical quality of radiotherapy in Canada.
(b) Describe the technical quality of radiotherapy for prostate cancer in Canada, in terms of compliance with predetermined quality criteria.
(c) Develop achievable benchmarks for compliance with each quality criterion.
(d) Identify the characteristics of centres which achieve the highest levels of compliance with quality criteria.

Methods

Study design

This was a criterion-based audit of the technical quality of curative radiotherapy for prostate cancer, based on a retrospective, cross-sectional, multi-institution, chart abstraction study. Quality of care was measured against a suite of indicators developed previously through an evidence-guided, national consultation process [2]. The project was directed by a Steering Committee with representatives from across Canada. "Centre Liaisons" (usually a leading genitourinary radiation oncologist) were identified to take responsibility for the onsite collection of data and its transfer for analysis. Ethics approval for the overall study was granted by the research ethics board (REB) of Queen's University, and by the REB of each participating institution.

Study population and sampling strategy

The study population included a random sample of all patients who started primary radiotherapy with curative intent for low-, medium- or high-risk localised cases [11] between July 2007 and June 2008. Postoperative cases were excluded. Each centre provided a list of all eligible cases, from which a random sample was selected by the coordinating centre. The number of cases randomly sampled was 20–40 depending on centre case volume. Cases found to be ineligible on central review were replaced by an additional randomly selected case.

We planned for an overall sample size of 633 cases to provide a reasonable degree of precision in the estimates of national compliance with each quality indicator (arbitrarily defined as 95% confidence limits of ±3% around a point estimate of 80% compliance). We chose a minimum sample size of 20 cases per participating centre in order to provide a working estimate of each centre's estimated compliance on each quality measure.

Data collection

A paper-based data abstraction form was pilot tested in three centres and translated for francophone centres. A User's Guide was created to provide detailed instructions on each data field. Data were collected at each centre by an individual supervised by the centre Study Liaison. Wherever possible, experienced clinical trials abstractors completed abstracted data. Radiotherapy staff assisted in abstracting data from the treatment record, when required. Data were entered into a central database and verified by independent cross-comparison with the original forms.

Quality indicators

The development of the suite of quality indicators involved a modified Delphi process as described previously [2]. These indicators were, wherever possible, evidence-based, and each was unanimously deemed to be important by national experts [2]. The suite of indicators was established before the audit was done, to avoid the risk that a detailed knowledge of current practise might exert pressure on the choice of quality criteria. The indicator domains included: pre-treatment assessment, external beam radiotherapy (EBRT), brachytherapy, androgen deprivation therapy (ADT), and follow-up [2]. In this report, we focus on the first two domains.

Analysis

Compliance on quality indicators

The overall (national) rate of compliance with each individual indicator (the percentage of cases which met the quality criterion) was calculated based on pooled data from all centres. The rate of compliance with each indicator at each individual centre was also calculated, and their distribution was described (median and range). Standard errors on each rate of compliance were calculated using the binomial approach. We also calculated the proportion of patients whose pre-treatment assessment and treatment met all quality criteria ($n = 15$, combining criteria relevant to subgroups such as appropriate prescribed dose).

Benchmarking

The quality criteria established for each indicator were designed to evaluate the quality of care in the individual case. Since, for some cases, it might be either not feasible, or not appropriate, to meet a particular criterion, the optimal centre-level compliance rate might fall short of 100%. To address this problem, we adopted a benchmarking approach to establish the minimum acceptable centre-level rate of compliance with each indicator. We use the term benchmarking here [12] and set benchmarks for centre-level performance on each indicator based on the level of compliance observed at best-performing centres, ensuring therefore that benchmarks were measured objectively and were demonstrably attainable [13]. In addition, the Steering Committee reviewed each proposed benchmark for validity and feasibility [14]. For each indicator, at least two centres achieved 100% compliance (as reported below). Benchmarks for compliance were, therefore, set at 100% for all but two indicators. The Steering Committee set less stringent benchmarks for compliance with two indicators concerning the use of staging bone scans and pelvic imaging, respectively, in low risk cases, recognising the potential indications for these investigations for purposes other than staging; benchmark rates were set at