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Original Article

Peer Review of Radiotherapy Planning: Quantifying Outcomes and a Proposal for Prospective Data Collection

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Abstract

Aims: The Canadian Partnership for Quality Radiotherapy quality assurance guidelines recommend that radiation oncologist peer review of curative radiotherapy plans takes place ideally before the first fraction of treatment is delivered. This study documented and evaluated the outcomes of weekly, disease site-specific, radiotherapy peer review, quality assurance rounds at the Tom Baker Cancer Centre in Calgary, Canada with a view to making recommendations about the optimal timing and documentation of peer review during the radiotherapy planning processes.

Materials and Methods: Outcomes of each case reviewed at (i) breast, (ii) head and neck (including thyroid and cutaneous cases) and (iii) lung team quality assurance rounds from 6 January to 5 May 2015 were recorded prospectively. Each radiotherapy plan was assigned an outcome: A for plans with no suggested changes; B for satisfactory, but where issues were raised to consider for future patients; or C when a change was recommended before the first or next fraction. The B outcomes were further subdivided into B1 for a case-specific concern and B2 for a policy gap. Plans were assessed after contour definition and before the plan was formulated (post-contouring reviews) and/or assessed when the plan was complete (post-planning reviews).

Results: 209 radiotherapy plans prescribed by 20 radiation oncologists were peer reviewed at 43 quality assurance meetings. 93% were curative-intent and 7% were palliative. 83% of plans were reviewed before delivery of the first treatment fraction. There were a total of 257 case reviews: 60 at the post-contouring stage, 197 at the post-planning stage, including 46 patients reviewed at both time points. Overall rates of A, B1, B2 and C outcomes were 78%, 9%, 4% and 9%, respectively. The most common reason for a B or C outcome was related to target volume definition. Only 56% of C outcomes at the post-planning stage would have been detected at the post-contouring stage. Results varied between tumour site groups.

Conclusions: 9% of radiotherapy plans reviewed had changes suggested before delivery to the patient. Review at the post-planning stage after plan completion was necessary to detect all suggested changes, but for head and neck cases, all C outcomes could have been detected at the post-contouring stage. More widespread implementation of radiotherapy peer review in the UK is recommended.

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Key words: Peer review of radiotherapy planning; radiotherapy quality assurance

Introduction

The ‘Towards Safer Radiotherapy’ report [1] detailed a framework for improving patient safety and reducing error in the process of radiotherapy delivery. The report highlighted that radiotherapy indications are generally reviewed by multidisciplinary teams but the details of target volume and dose prescription are not usually evaluated by a separate clinician. Given that variation in physician contouring is well documented [2], peer review of the professional decisions made during radiotherapy planning should be a standard of care. Deviations from trial radiotherapy standards have been shown to have a detrimental effect on patient outcomes [3].

Quality assurance of physician contouring and radiotherapy plan quality are now expected in multicentre radiotherapy trials [4]. Peer review of clinical radiotherapy plans is not yet standard in UK practice, however, the recent Royal College of Radiologists publication on consultant job planning advocates the use of peer review as an important component of radiotherapy quality assurance [5]. As

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radiotherapy practice evolves to deliver higher, targeted doses to smaller volumes, target definition and dosimetry review becomes increasingly important. Elements of a radiotherapy plan that could be evaluated include indications for treatment, target volume and organs at risk (OAR) definition, choice of dose/fractionation, plan design elements, such as number of fields or use of bolus, and compliance with policy guidelines.

Most North American radiotherapy centres incorporate aspects of peer review into routine practice [6,7]. An American Society for Radiation Oncology (ASTRO) white paper provides a framework for peer review activities [8]. The Canadian Partnership for Quality Radiotherapy issued quality assurance guidelines first published in 2011, which included the recommendation that curative-intent treatment volumes and dosimetry be peer reviewed by a radiation oncologist, ideally before the first fraction or within the first 25% of a prescribed course [9]. Peer review quality assurance meetings can optimise radiotherapy plans for individual patients, streamline physician practice, improve interdisciplinary communication and collaboration and be an excellent teaching opportunity for oncology, physics and radiography trainees [8,10].

In most Canadian radiotherapy centres, regular peer review quality assurance meetings occur [6] but the frequency, structure and documentation processes differ. Some sites aim to review all curative-intent and complex palliative plans, others review a random sample of plans. Standards have not been agreed for documentation or the timing of review during the planning process.

This is a report of a project undertaken in a mid-sized Canadian radiotherapy centre, to standardise the nomenclature and documentation of peer review quality assurance meetings and to define the optimal time to peer review radiotherapy plans.

Prior to this project, seven weekly one hour tumour site-specific peer review meetings took place at the Tom Baker Cancer Centre (TBCC). Review outcomes were fed back informally within each meeting but with no documentation of the discussions and decisions taking place, and no standardised terminology to measure the outcomes of peer review. There was therefore an opportunity to standardise the nomenclature used and to document and quantify the work taking place within these meetings and the subsequent impact on patient care within the radiotherapy planning pathway. Approaches to peer review within the seven meetings were variable and therefore a selection of three of the seven meetings (breast, lung and head and neck groups) was chosen to pilot recording of outcomes in the first instance. At the beginning of the study we adapted the A, B, C classification system designed by Lefresne *et al.* [11] to document the outcomes from the three meetings.

Materials and Methods

At TBCC, Calgary, Canada, data collection was undertaken prospectively from 6 January to 5 May 2015 from cases reviewed at the 1 hour/week quality assurance meetings of the breast, head and neck (including thyroid and cutaneous cases) and lung tumour sites.

Case Review

In terms of choice of cases, the head and neck and lung groups aimed to assess all curatively treated patients, but due to curative case volume, the breast group prioritised locoregionally treated patients over breast-alone treatments. No targets existed for the number of patients to be reviewed per week, with a principal focus on the quality of review. Cases were identified as either 'curative' or 'palliative'.

The case review was conducted in a seminar room equipped with two computers, one to access the electronic medical records for clinical details and the other to project the radiotherapy contours and/or plan for group review. The seminar room enabled video-conference with radiation oncologists from two neighbouring, small radiotherapy centres. Following a clinical synopsis by the treating radiation oncologist or rounds chair, indications for treatment, target and OAR contours, dose/fractionation and dose volume histograms were reviewed. Review took place regardless of the treating radiation oncologist's attendance. A record of the number of radiation oncologists in attendance was made, principally to ensure that at least two radiation oncologists were in attendance in order to constitute a peer review. In accordance with Canadian Partnership for Quality Radiotherapy recommendation, it was documented whether peer review took place prior to delivery of the first treatment fraction.

Outcomes

The assembled radiation oncologists agreed to a consensus A, B or C outcome as previously described [11].

A plans were considered satisfactory with no suggested changes, a B outcome meant the plan was satisfactory but case discussion had identified issues to consider for future patients and a C meant an unsatisfactory plan, with a change recommended before the first or next fraction. The B outcomes were further subdivided into B1 for a case-specific concern and B2 for a policy gap for that clinical circumstance that should be developed for future patients. The rate of C outcomes could be considered to be the 'error detection rate' in the quality assurance process. We recorded whether the treating physician changed the plan as a consequence of a C outcome, although within this study there was no obligation to do so.

Timing of Peer Review

Across the three groups there were different approaches to the timing of radiotherapy peer review. In order to assess the optimal timing, we categorised these approaches according to the time point of peer review. Some cases were reviewed after the plan had been approved by the treating physician. This provided an opportunity for a 'global review' of the case, including target volume definition, OARs,

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