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Overview

Evidence-based Peer Review for Radiation Therapy – Updated Review of the Literature with a Focus on Tumour Subsite and Treatment Modality

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Abstract

Technological advances in radiation therapy permit steep dose gradients from the target to spare normal tissue, but increase the risk of geographic miss. Suboptimal target delineation adversely affects clinical outcomes. Prospective peer review is a method for quality assurance of oncologists' radiotherapy plans. Published surveys suggest it is widely implemented. However, it may not be feasible to review every case before commencement of radiation therapy in all departments. The rate of plan changes following peer review of cases without a specific subsite or modality is typically around 10%. Stereotactic body radiation therapy, head and neck, gynaecological, gastrointestinal, haematological and lung cases are associated with higher rates of change of around 25%. These cases could thus be prioritised for peer review. Other factors may limit peer review efficacy including organisational culture, time constraints and the physical environment in which sessions are held. Recommendations for peer review endorsed by the American Society for Radiation Oncology were made available in 2013, but a number of relevant studies have been published since. Here we review and update the literature, and provide an updated suggestion for the implementation of peer review to serve as an adjunct to published guidelines. This may help practitioners evaluate their current processes and maximise the utility and effectiveness of peer review sessions.

Key words: Contouring; peer review; quality assurance; radiation therapy; target volume

Statement of Search Strategies Used and Sources of Information

Searches for original and review articles relating to peer review utilisation and outcomes were conducted on Pubmed and Medline databases. The final search was carried out in January 2017. Search terms included 'peer review', 'quality assurance', 'chart rounds', 'volume delineation' and 'contouring'. These were combined with Boolean operators 'AND radiotherapy' and 'AND radiation'. Bibliographies were reviewed for additional relevant references. Data regarding peer review utilisation, outcomes, duration, frequency, topics, timing and limiting factors were recorded. Papers relating to peer review within co-operative group trials were excluded as it was felt they would not reflect 'real world' practice.

Introduction

Improving the quality of healthcare is an increasingly prominent issue. For radiation therapy, rigorous quality assurance processes have been developed by therapists and medical physicists, focusing on the technical aspects of treatment delivery [1]. The safety and quality of treatment prescribed by radiation oncologists is less stringently

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assessed, largely because clinical decisions are individualised and may not follow a standardised protocol in the same way.

Radiation oncologists are responsible for target volume and normal tissue organ-at-risk (OAR) contouring, which has been described as one of the 'weakest links' in the radiation therapy treatment chain [1,2]. Contouring accuracy is difficult to quantify and measure because subjective interpretation is required. Increasing treatment complexity coupled with time and resource pressures can create a work environment conducive to human error [3,4]. These factors may lead to under-dosing of tumour, over-dosing of normal tissue or suboptimal dosimetric optimisation based on inaccurate anatomical information [5–7]. Furthermore, radiation oncologists make clinical decisions regarding dose and fractionation and must determine priorities between target volume coverage and OAR constraints when compromises are required. Inappropriate or erroneous choices can lead to poor quality radiation therapy.

Poor quality radiation therapy negatively affects clinical outcomes [8–11]. Within the context of co-operative group trials, radiation therapy protocol violations have been associated with significantly higher rates of locoregional and distant failure, increased toxicity and inferior overall survival [8]. Peer review, also known as 'chart rounds', is a method for reviewing the quality of treatment prescribed by radiation oncologists.

Peer review should be considered an integral component of radiation therapy quality assurance but implementation is variable and multiple factors can affect its effectiveness and efficiency [12–15]. A Cochrane review found that audit and feedback was an effective tool in improving health professionals' practice, although there were no studies specific to radiation oncology [16]. The evidence base for peer review in the radiation therapy setting is scant and heterogeneous in nature, making interpretation difficult.

To guide implementation, several organisations have published recommendations, including the American Society for Radiation Oncology (ASTRO), the Royal Australian and New Zealand College of Radiologists (RANZCR) and the Canadian Partnership for Quality Radiotherapy [12,17,18]. High quality data are lacking but a number of relevant studies have been reported since these guidelines were introduced. Herein, we provide an updated overview of the literature on peer review with a focus on differences between tumour subsites, and reasons for variation. We provide an evidence-based suggestion for case prioritisation as an addition to existing guidelines.

Results

Fourteen articles matched the primary search criteria and a further three were identified. Thirteen of these studies have been published since 2013, which was when peer review guidelines were last introduced via the 2013 ASTRO white paper [12].

In total, there were four surveys investigating peer review practices and utilisation; all were based in North America (Table 1). These contained data relating to the proportion of cases reviewed and the rate of changes recommended following peer review sessions. In two reports, the duration of peer review sessions were also described. In addition to the 4 surveys, there were 13 reports of peer review practices within individual institutions.

Utilisation of Peer Review

Clinicians broadly agree that peer review is an important activity [13,20,21]. Although the clinical outcome of peer review has not been directly measured, it may improve or at least affirm the quality of treatment through adherence to established guidelines and protocols [12].

North American surveys have shown wide implementation of peer review among respondents. A survey of all 44 regional cancer treatment facilities (also known as radiation oncology programmes) in Canada found that around half review at least 80% of curative-intent plans [20]. In the USA, 70–80% of all radiation therapy courses undergo peer review, with lower rates for brachytherapy (40–47%) and radiosurgery (58%) [1,21]. However, there are issues that extend beyond simply presenting a plan for review. The Canadian partnership for quality radiation therapy recommends that every radical definitive or adjuvant plan undergoes peer review before radiation therapy commencement [18]. In practice this occurs in less than 40% of cases [1,20,21,31], probably reflecting 'real world' conditions where it may not be feasible to achieve this. As radiation therapy departments face increasing demands and time pressures, they may be required to decide which specific cases should be prioritised for peer review.

Outcomes from Peer Review

The rates of change following peer review can be quantified and have been reported in a number of studies. Significant variability exists (Table 1). For cases that are neither subsite-oriented nor relating to stereotactic body radiation therapy (SBRT), the rate of changes after peer review seems to be lowest at 3.8–12.2% of cases [7,13,14,24,25,27–29]. Acknowledging the heterogeneity that exists, the combined overall rate of change in 8721 cases was 10.9%. This is concordant with a recent systematic review [32].

The highest rates of plan changes were shown in specific subsites, including head and neck, gynaecological, gastrointestinal and haematological, and lung SBRT cases. Mackenzie *et al.* [29] reported a very low rate of change for their cohort of head and neck cases. This was postulated to be due to a high degree of consensus among their four head and neck radiation oncologists and well-established departmental guidelines. This study also found a high rate of change for a subset of breast cases deemed to be 'complex' (such as those requiring nodal irradiation). By comparison, Lymberiou *et al.* [30] found the overall rate of change for over 2000 breast cases to be 4.4%, although a correlation between complexity and rates of change was also reported. The overall rate of change in 2228 head and neck, gynaecological, gastrointestinal, haematological, complex breast

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