Ontario Health
Cancer Care Ontario

Radiation Oncology Peer Review Guidance Document for Breast Cancer

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Executive Summary

A modified Delphi process was used to reach multidisciplinary expert consensus on best-practices for peer review of radiation treatment plans for patients with breast cancer. The process was informed by the available literature. The multi-disciplinary group of participants included a patient representative from the Canadian Partnership for Quality Radiotherapy, radiation oncologists (ROs) with expertise in breast cancer, medical radiation therapists with expertise in breast cancer radiotherapy (MRT(T)s), medical physicists with expertise in breast cancer radiotherapy planning (MPs), a radiation oncology fellow, and administrative staff. A literature search was undertaken to identify candidate elements for peer review of breast cancer radiotherapy plans for external beam treatment. Three Delphi rounds were undertaken (one pre-meeting, one at a face-to-face meeting, and one post-meeting) to quantify participants' rankings of the importance of each peer review candidate element and to clarify the wording of each ranked element. Peer review elements were considered for scenarios involving treatment to the intact breast, with or without nodal treatment and/or boost to the resection cavity. The final consensus voting showed very high agreement on nine elements deemed essential for peer review. An additional eight optional elements with high agreement were identified. Peer review was endorsed as an essential component of overall treatment quality assurance and should be completed ideally for all breast cancer patients undergoing radiotherapy with curative intent.

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BACKGROUND AND SUMMARY OF THE LITERATURE

Radiation Oncology peer review of radiation therapy plans is an essential component of quality assurance within radiation oncology clinical programs in Canada. Peer review is a key programmatic quality indicator identified by the Canadian Partnership for Quality Radiotherapy and is included in the Accreditation Canada Q-mentum Module for Radiation Oncology.
Peer review in radiation therapy is broadly defined as "the evaluation of components of a radiation treatment plan by a second radiation oncologist". The evaluation may be completed by a single radiation oncologist or may be conducted in a multidisciplinary group setting with one or more reviewing radiation oncologists involved. The common component to each approach is a second review by a radiation oncologist.

There are no randomized trials of peer review implementation at the population level that can inform policy for best clinical practice. A recent cross-sectional analysis of peer review outcomes across all Ontario radiation oncology programs showed that changes were recommended in 3.3% of all (n=5,530) peer-reviewed treatment plans (data collected over at three-month period in 14 centres). The types of changes recommended related to target volume (66%), technique/dosimetry (13%), organs at risk (11%), and other (10%). In a sub-group analysis of 2,004 peer reviewed breast cancer plans, changes were recommended in 3.0% of left-sided breast cases and 2.4% of right-sided cases. No significant differences in the proportion of cases with changes recommended were seen between left vs right sided primaries, nor by breast only vs. breast and regional node techniques.

A number of additional case series were reviewed. Lymberiou et al. described peer review of breast cancer cases at a single Ontario institution over two years 2010-2012. A total of 2223 plans were peer reviewed and changes were recommended in 4.4% of cases, including those considered to have minor impact (2.1% of total) and those considered major (2.3% of total). Regional nodal irradiation plans had a more than doubled likelihood of a change being recommended (OR=2.12, p=.0075). For a subgroup of patients with "low risk" plans (i.e., including all of regional nodes not treated, tumour < 2 cm, no boost, no node dissection) changes were recommended in 1.4% of peer reviewed cases.

Lefresne and colleagues reported their peer review experience from a single centre of the British Columbia Cancer Agency during 2001-2011. Changes were recommended in 7% of plans across all sites including 6% minor and 1% major changes. In a sub-set of 387 breast treatment plans, minor changes were recommended in 3% of cases and major changes in 1% of cases (n=5). The changes to approved plans included a variety of concerns, target volume delineation and organs at risk protection, among others.

Ballo and colleagues described peer review of 2988 radiotherapy treatment plans at a single American institution from 2007-2012. Overall, 12.2% of plans had changes recommended. Among the 1432 breast cases peer-reviewed, changes were recommended in 6.9%. The report did not distinguish between minor or major changes but identified that there was a trend toward fewer plan changes over time.

Table 1 - summarizes the relevant case-series.

Study Population	Number of breast cancer cases	Percent of minor or grade "B" events	Percent of major or grade "C" events	Other key findings
Princess Margaret Cancer Centre 2010-2012	2223	2.1%	2.3%	Regional node volumes increased risk of recommended change; lowest risk group and 1.4% event rate overall
Cancer Care Ontario 2015	2004	1.7%	1.1%	No difference was found for laterality or plan complexity regarding the proportion of plans for which major or minor recommendations for change were made
BCCA Vancouver Island 2001-2011	387	3%	1%	Major recommendations included both target and OAR concerns
MD Anderson	2988	6.9%		Minor and major not distinguished. Rates shown to decrease over time

Table 2- summarizes the data from the Ontario cross-sectional study.

Treatment region	Left breast	Plan change recommended	Right breast	Plan change recommended
Breast only	422	14 (3 major) (3%)	442	10 (1 major) (2%)
Breast plus Boost	194	1 (0.5%)	134	1 (0.7%)
Breast plus Nodes	100	5 (2 major) (5%)	105	4 (2 major) (4%)
Breast + Boost + Nodes	49	3 (3 major) (6%)	61	3 (3 major) (5%)
Total	**765**	**23 (3.0%) [95% CI 1.9-4.5]**	**742**	**18 (2.4%) [95%CI 1.4-3.8]**

METHODS

We conducted a modified Delphi process designed to achieve expert consensus on the required (and optional) elements of peer review for patients receiving curative-intent radiotherapy to the breast following lumpectomy. A detailed description of the methods is found in the appendix.

FINAL DELPHI ROUND RESULTS

Nine peer elements of radiotherapy plans were deemed to be essential to the peer review process (Table 3). On the final survey round, these nine elements were endorsed as being either essential or important to review by 77% to 100% of panel members.

Further, among the nine essential elements, 80% or more of Delphi panel members thought that the peer review should be done by an RO The one element that was agreed could be reviewed by a non-RO was the heart contours (42%). Thus, while review of the heart contours was considered to be essential, the potential to delegate the quality assurance of heart contours to an appropriately trained MRT(T) was acknowledged.

Required and Optional Elements for Peer Review

Table 3 summarizes the Delphi recommendations for each element identified in the review. **Section 1** summarizes the findings for the nine elements deemed essential for quality peer review. Optional elements are listed in **Section 2** of the Table. A brief rationale and elaboration is provided for each element.

Scope of Breast Cancer Cases Undergoing Peer Review

The panel recommended that all curative intent plans be reviewed by a peer-review process; however, the panel recognized that this target may not be easily achieved by all centers. The panel recognized the evidence suggesting that less complicated cases (e.g., right-sided tangents with no boost nor regional nodal treatment) were less likely to have changes recommended. However, it was felt that the optimal approach would be that all curative-intent plans should be subject to peer review to evaluate various patient- or plan-specific elements.

The panel made the following recommendations:

- Radiation therapy programs should ideally review all breast cancer cases being treated with curative intent (because of the unpredictable nature of which plans have changes recommended).
- If all cases cannot be reviewed, there should be an explicit policy, agreed to by the local program, to select cases. Loosely defined convenience sampling was discouraged.
- If all cases cannot be reviewed, selection of cases should prioritize left-sided plans and cases where a boost or the regional nodes are included in the treatment plan.

Table 3 - Best Practices for Breast Radiotherapy Peer Review: Essential and Optional Elements

Peer Review Element	Qualifying Statements	Elaborations
Section 1: Essential Elements of Peer-Review (level 1 priority)		
Patient Selection		
1.1 Indication for radiotherapy and decision to treat	• Includes review of indications for breast, boost, and regional nodal components	• Rationale: A second RO with breast cancer treatment expertise should verify the indication(s) for radiotherapy (as present) as well as the indications for boost or regional nodal radiotherapy (present or absent) according to local policy. • Review of the primary documentation is preferred, but for efficiency, the consult note is considered sufficient as the reference document • A brief written or verbal "RO summary" of the essential elements of the case (i.e. sufficient to determine indications for breast, nodal, or boost volumes) is considered an acceptable source alternative to the consult note • Correct laterality, while critical to ensure, is beyond the scope of peer review. Centres need to ensure adequate QA processes are in place to ensure the correct breast is treated.
Radiotherapy Prescription		
1.2 Prescribed dose and dose per fraction		• Rationale: A second RO with breast cancer treatment expertise should verify that the proposed dose and fractionation are acceptable • Dose and fractionation should also be consistent with local policy where such policy exists

Peer Review Element	Qualifying Statements	Elaborations
1.3 Review of contouring of resection cavity	• Essential for patients with boost prescribed. • Optional but recommended (to guide tangent field placement) when no boost is prescribed.	• Rationale: A second RO with breast cancer treatment expertise should verify that the proposed volume segmentation of the resection policy is acceptable • Ensure seroma is covered in tangent fields and in boost
1.4 Review of regional lymph nodal coverage	• Distinct approaches for volume-planned versus anatomically planned cases are required.	• Rationale: If the nodal volumes are contoured, a second RO with breast cancer treatment expertise should verify that the proposed contours are acceptable (and consistent with local policy where available). • Some centres use conventional anatomy-guided field borders for nodal field delineation, in which case review of the prescribed fields should be undertaken for position and coverage based on local policy.
Critical Organs at Risk		
1.5 Review of heart contours	• Review of heart contours may be delegated to an MRT(T) who has demonstrated competence. • For treatment to the right breast, generation and review of heart contours was considered optional	• Rationale: For left-sided cases, a second RO (or delegate MRT(T)/planner) should verify that the proposed cardiac contours are acceptable (and consistent with local policy where available). • Heart contouring (and thus peer review) was considered optional for most right-sided cases. An exception in some centres is cases with nodal treatments that included the IMC, in which case peer review of heart contours was recommended but not essential. Left Ant. Descending vessel contouring was also considered acceptable practice (as an alternative to heart contouring)
Radiotherapy Plan Evaluation		

Peer Review Element	Qualifying Statements	Elaborations
1.6 PTV Coverage and Dose Conformity	• PTV coverage and dose conformity review is essential, but could be delegated to medical physics if a clear planning protocol is in place and the dose constraints of that protocol are met.	• Rationale: If PTV-based planning is utilized, a second RO with breast cancer treatment expertise should verify that the dose coverage of the PTV on the proposed plan is acceptable (and consistent with local policy). The PTV should not be adjusted by the RO.
1.7 DVH for lung		• Rationale: A second RO with breast cancer treatment expertise should verify that the proposed plan meets local dose constraints for the lung OAR. • Since specific patient factors often lead to clinical judgement being required to define acceptable lung dose (given potential "trade-offs" between lung DVH and PTV coverage), this task was not felt appropriate to delegate. • Peer review may be considered optional, however, if a planning protocol is in place that clearly specifies DVH constraints, and the proposed plan meets all constraints, including those for lung OAR.
1.8 DVH for heart		• Rationale: A second RO with breast cancer treatment expertise should verify that the proposed plan meets local dose constraints for the heart OAR. • Since specific patient factors often lead to clinical judgement being required to define acceptable cardiac dose (given potential "trade-offs" between cardiac DVH and PTV coverage), this task was not felt appropriate to delegate. • Centres routinely employing a deep-inspiration breath hold technique for left-sided cases may consider peer review of heart DVH unnecessary if all constraints are met.

Peer Review Element	Qualifying Statements	Elaborations
1.9 Dose distribution homogeneity		• Rationale: A second RO with breast cancer treatment expertise should verify that the dose heterogeneity of the proposed plan is acceptable and does not exceed local policy parameters.
Section 2: Optional Elements of Peer Review Quality Assurance (level 2 priority)		
2.1 Review of Contouring of breast		• Rationale: Contouring of the breast is sometimes utilized (target volume-based planning) and sometimes not (typically with field-based planning techniques). • Review of breast contours, when utilized, can be done by a second RO, or could be delegated to a competent MRT(T). • Peer review of breast contours is recommended, but not essential, for IMRT-based planning protocols.
2.2 Contouring of lungs		• Rationale: Lung contours are often software generated. Quality assurance of lung contours, whether generated by computer or by hand, can appropriately be performed by treatment planners/MRT(T)s.
2.3 Contouring of spinal canal/cord		• Rationale: Contouring of the spine canal can reliably be done by MRT(T)s and does not require peer review by a radiation oncologist.
2.4 Contouring of brachial plexus		• Rationale: Contouring of the brachial plexus is not considered a standard of care in most breast cancer RT plans. Peer review is optional if this OAR is contoured.
2.5 DVH for spinal cord		• Rationale: Peer review is not required, since dose constraints are very rarely exceeded.

Peer Review Element	Qualifying Statements	Elaborations
2.6 Port films and/or CBCT 2.7 Set-up issues (i.e. reproducibility)		• Rationale: Quality assurance and best practices for daily imaging and assessment of reproducibility are very important but are not part of RO peer review.
2.8 Peer Review Element: Skin rendering/body surface view (beam entry)		• In many centres, therapists on the treatment unit refer to skin rendering views to ensure adequate/appropriate coverage. RO peer review was not felt to be required.

APPENDIX: GUIDANCE DEVELOPMENT METHODS

A literature review was undertaken to identify an initial list of breast cancer peer-review elements. This list was supplemented with patterns of practice findings from a pan-Canadian survey. A steering committee refined the list to reduce ambiguity and to propose draft wording of each peer-review element. Candidate peer review elements were grouped into three subgroups: volume segmentation for target volumes and field-based target considerations, organs at risk, dosimetric and plan quality, and other.

The Delphi panel was constructed by first inviting radiation oncologist who had participated in a pan-Canadian Delphi panel addressing key quality indicators for radiotherapy for breast cancer. This list was supplemented with selected invitees from medical physics and medical radiation therapy with a demonstrated interest in breast cancer radiotherapy and/or peer review, and a patient representative with experience in breast cancer from the CPQR. The final list was chosen to ensure multidisciplinary and regional representation.

The first Delphi round involved an anonymous online survey of panel members regarding the list of candidate peer review elements. Participants were asked to rate each element on its perceived importance for ensuring quality of radiotherapy, and to indicate whether peer review on the element required a second radiation oncologist or could be achieved with an alternative quality assurance process. Rankings were based on a four-point Likert scale “(not important” to “essential”). Second, participants were asked to rate each element for clarity on a comparable four-point scale. Finally, participants were given the opportunity to suggest additional candidate elements.

The second Delphi round was a face-to-face of the steering committee and breast radiation oncology experts with representation from all Canadian geographical regions. Participants included the patient advocate, 14 ROs, 1 MP, 3 MRT(T)s and 3 administrative staff. Each candidate element was reviewed by presenting the first-round survey results, followed by open discussion and final voting. Software used during the iterative Delphi discussion allowed for anonymous voting on candidate quality indicators and facilitated immediate feedback and interpretation of variation.

In the third Delphi round, elements that were endorsed in the second round were discussed by the steering group for final wording. This was followed by a survey of the Delphi panel to determine degree of agreement (yes/no) with the status and wording of each element.