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Original Article

# Building a New Model of Care for Rapid Breast Radiotherapy Treatment Planning: Evaluation of the Advanced Practice Radiation Therapist in Cavity Delineation

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## Abstract

*Aims:* Breast radiotherapy treatment is commonly managed by a multidisciplinary team to ensure optimal delivery of care. We sought a new model of care whereby a clinical specialist radiation therapist (CSRT) delineates the cavity target for whole breast radiotherapy treatment planning and the radiation oncologist validates the contour during final plan review. This study evaluated the radiation oncologist's acceptance of these contours and identified characteristics of cavities suitable for CSRT-directed contouring.

*Materials and methods:* Following specialised breast oncology education and training by the radiation oncologist, the CSRT prospectively delineated cavities in 30 tangential breast radiotherapy cases and consulted the radiation oncologist in 'complex' cases but directed 'non-complex' cases for treatment planning. Changes to CSRT contours were evaluated using the conformity index. Breast density, time since surgery and cavity location, size and visualisation score [CVS: range 1 (no visible cavity) to 5 (homogenous cavity)] were captured.

*Results:* Of the 30 CSRT delineated cavities contours, the CSRT directed 20 (66.7%) cases for planning without radiation oncology review; 19 were accepted (without changes) by the radiation oncologist upon final plan review and one was changed by the radiation oncologist (conformity index = 0.93) for boost treatment and did not affect the tangential treatment plan. Ten (33.3%) cases, all CVS $\leq$ 3, were reviewed with the radiation oncologist before planning (conformity index = 0.88 $\pm$ 0.12). CVS was inversely correlated with breast density and cavity size ($P < 0.01$).

*Conclusions:* The CSRT delineated cavities appropriate for clinical radiotherapy treatment planning in women with well-visualised cavities, whereas 'complex' cases with dense breast parenchyma, CVS $\leq$ 3, and/or cases needing boost radiotherapy treatment required review with the radiation oncologist before planning.


*Key words:* Advanced practice radiation therapist; breast cancer; cavity contour delineation; clinical specialist radiation therapist; radiotherapy treatment; role development

## Introduction

In early-stage breast cancer, the addition of radiotherapy after breast-conserving surgery is a standard treatment approach that decreases breast recurrence and breast cancer deaths [1]. In Canada, about two-thirds of women with breast cancer received radiotherapy between 2005 and 2010, with most women being stage I (37.8%) and stage II (33.8%) [2]. With the increasing frequency of breast cancer treatment requiring radiotherapy, concerns about costs, particularly in countries with publicly funded health care systems, are growing. Creative and innovative means to manage the growing radiotherapy needs with limited funding structures and to capitalise on models of care that enhance efficiencies in human resources need to be explored and validated.

The development of a multidisciplinary approach in cancer care is being recognised as a means to achieve 'personalised medicine' through the collaborative efforts of various medical professionals [3]. Advancements in radiotherapy imaging, planning and treatment delivery have led to increased specialisation of radiation oncologists, medical physicists and radiation therapists (RTTs). RTTs are increasingly being recognised as experts in radiotherapy

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plan development, treatment delivery and patient care [3]. Many RTTs and planners (dosimetrists) have increasing roles in contouring normal organs at risk and treatment targets after the attainment of specialised site-specific skills [4–7]. Role expansion by RTTs to include contouring tasks not only enhances patient throughput, but also increases system efficiencies, cost-effectiveness and improves the satisfaction of the health care team [8–10].

Contouring roles for RTTs have been explored in previous studies. One such study evaluated the variability in breast clinical target volume (CTV) delineation in tangential breast radiotherapy between radiation oncologists and RTTs and found high agreement between the radiation oncologist and RTT groups when standardised contouring guidelines were used [11]. A previous study explored the concordance of postoperative cavity contouring in whole breast radiotherapy between a group of seven radiation oncologists and a breast site, clinical specialist radiation therapist (CSRT) and found high agreement between CSRT cavity contours and radiation oncologist consensus contours [5]. Although this study validates the ability of the CSRT to perform cavity delineation after specialised education and training, the study evaluated contours generated within the context of a non-clinical learning environment. Therefore, we sought to determine if a specially trained RTT could similarly perform cavity target delineation acceptable for whole breast radiotherapy planning in the context of a clinical working environment at a large cancer centre.

The goal of this new model of care is to optimise radiotherapy planning efficiency while ensuring timely access to radiotherapy without increased radiation oncologist workload. The CSRT, an advanced practice RTT/dosimetrist with specialised breast oncology education and training from radiation oncologists, delineated the cavity target to initiate the breast radiotherapy planning process with the radiation oncologist assessing the cavity contour during final treatment plan review. The specific objectives of this study were to determine the radiation oncologist acceptance of the CSRT cavity contours for planning and to identify characteristics of 'complex' contouring cases that would benefit from earlier consultation and input from the radiation oncologist before the initiation of the treatment planning process. An understanding of these features will allow for the potential identification of a subgroup of whole breast radiotherapy patients for which the CSRT can initiate cavity contouring to expedite the treatment process.

## Materials and Methods

This study was approved by our institutional Research Ethics Board. Prospective data were collected for 30 consecutive women with early-stage breast cancer receiving post-lumpectomy whole breast radiotherapy through a rapid treatment process [12]. All patients were immobilised using a breast board (MEDTEC, Orange City, IA, USA) in the supine position, with the ipsilateral arm abducted >90° and scanned using a computed tomography scanner with a 2 mm slice thickness. Treatment planning was completed using the Pinnacle$^3$ planning system (Philips Medical System, Fitchburg, WI, USA). Before the initiation of treatment planning, the delineation of the postoperative seroma (cavity) was required to ensure it was within the breast CTV, the tangential breast radiotherapy plan and the boost CTV for patients who require boost treatments. Upon completion of the cavity contour, automated software was used to generate the breast CTV, field placement and intensity-modulated radiotherapy plan [13].

### *Cavity Delineation and Analysis*

Two radiation oncologists (RED, CAK) provided teaching to the CSRT and defined criteria for breast cavity contouring and the planning process before the initiation of the study (Figure 1). The CSRT had access to all patient reports, such as operative notes, pathology reports, any relevant preoperative imaging, and delineated the initial cavity contours for all patients. The cavity volume was defined as the postoperative seroma visible on computed tomography after surgical removal of the breast tumour and included surgical clips if present. The placement of surgical clips was at the discretion of the individual surgeon (for example, in the identification of potentially close resection margins and were only present in three patients). We did not request

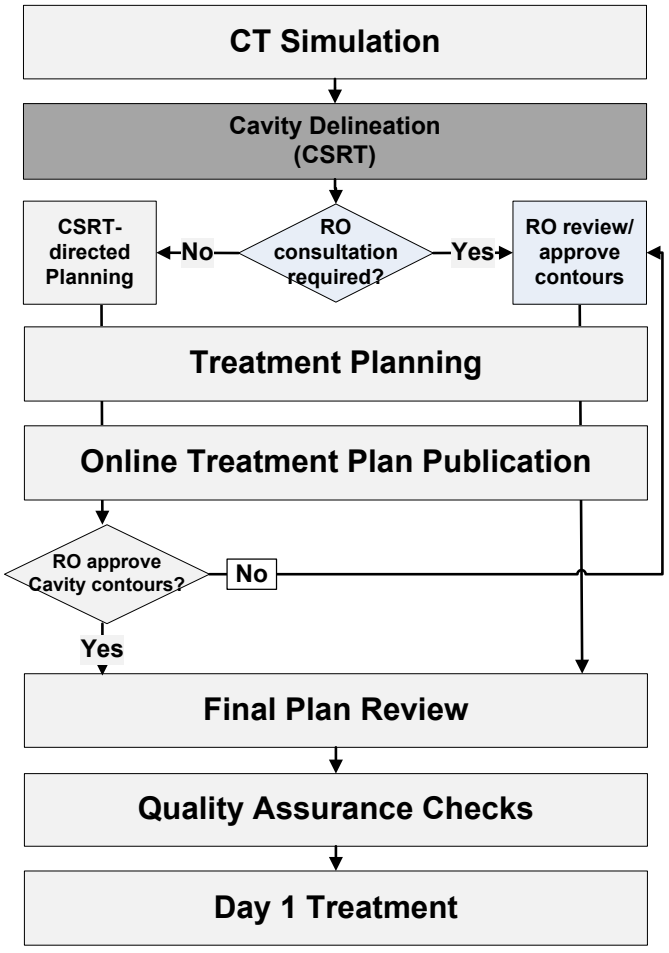


**Fig 1.** The flow of the radiotherapy treatment planning process.

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