Guidelines for IMRT Utilization in Breast Cancer Treatment for Non-Nodal Treatment: A Summary of "Good Practice" Guidelines from the Michigan Radiation Oncology Quality Consortium (MROQC) Working Group on Breast Cancer.

Outline:

- Task: Make recommendations related to planning and delivery considerations when IMRT is used for treatment of breast cancer in women without nodal directed therapy.
  Certain groups suitable for IMRT treatment based on:
  - The predicted likelihood of acute toxicity as defined by either moist desquamation or breast pain.
  - Inability to achieve adequate target coverage using other techniques.
  - Desire to avoid normal tissue toxicity that is not achievable using other techniques.
  - Desire to achieve acceptable dose homogeneity to the breast.

Recommendations for appropriate IMRT utilization:

In some situations, an institution may consider IMRT to balance PTV coverage and organ-at-risk tradeoffs. These guidelines are meant to provide considerations for good practice when IMRT is used. Because IMRT utilizes inverse-planning, this proposed practice guideline emphasizes the creation of contours to drive plan optimization.

1) ***Contouring guidelines:*** When creating the MROQC contouring guidelines, the IMRT Work Group reviewed the guidelines from the RTOG 1005 protocol* (PI: Frank Vicini, MD). The proposed guidance has been updated considering feedback from the discussion at the June 9, 2017 consortium meeting and meetings of the IMRT Work Group.

Structure Name	Origin	MROQC Definition
PTV_Breast_L, PTV_L_Breast PTV_Breast_R, PTV_R_Breast	Defined with markers and CT	At the time of simulation markers may be placed at the location of the surgical bed incision and to the outline of the palpable breast tissue.
CTVsb or CTV_High	MD drawn	From RTOG 1005: "Contour using all available clinical and radiographic information including the excision cavity volume, architectural distortion, surgical bed scar, seroma and/or extent of surgical clips (clips are strongly recommended)."
PTVsb or PTV_High	Surgical Bed + X cm (institution determines value within 0.5-1.5 cm)	The 3D expansion should exclude the heart. The surgical bed PTV should not cross midline. (0.5-1.5 cm recommended) Institutions may choose to limit this volume to 3, 4, or 5 mm from the patient surface due to uncertainties in the dose calculation when applicable.

2) ***Target coverage:*** The MROQC consensus recommendation in all cases of patients managed surgically with lumpectomy is that the surgical bed be contoured based on both surgical clips and post-surgical changes. The PTVsb (or PTV_High) structure should receive a minimum of **95%** of the dose to **95%** of the volume.

3) ***Dose constraints to organs at risk (OAR):*** When utilizing IMRT for breast cancer treatment, it is recommended that the normal organs at risk be defined as per RTOG contouring guidelines**. Structure names will be provided and will follow the guidelines of the AAPM Task Group 263 report. These organs at risk include, at minimum, the heart and ipsilateral lung. The recommended guidelines for organ at risk dose constraints are shown in the table below:

~~a.~~ Heart dose constraints: Cardiac dose can be minimized by the following methods: deep inspiration breath hold, a heart block, and prone positioning.

b. Lung dose constraints: For women with either right or left sided breast cancers, the recommendation is that the mean ipsilateral lung dose be limited to **≤10 Gy** and the V20 be **≤ 20%.**

Dose Constraint	Mean Dose	V20
Heart (Hypofractionated)		
Left-sided tumor	≤1.00 Gy	
Right-sided tumor	≤0.70 Gy	
Heart (Conventional fractionation)		
Left-sided tumor	≤1.70 Gy	
Right-sided tumor	≤1.00 Gy	
Lung		
Ipsilateral lung	≤10.0 Gy	≤20%

4) ***Dose homogeneity:*** When IMRT is to be utilized for dose homogeneity throughout the breast tissue, it is recommended that the entirety of breast tissue be contoured as the total breast volume. Given variation in breast size, shape, and contour, IMRT may be necessary to ensure acceptable homogeneity to this created breast tissue contour. Note that the PTVsb (or PTV_High) and/or the whole breast volumes may be retracted back from the surface. The recommendation is that:

a. PTVsb (or PTV_High)**: 95-107%** dose to the whole volume
b. Whole breast: **≤107%** maximum dose

Resources:

- *RTOG 1005: A Phase III trial of accelerated whole breast irradiation with hypofractionation plus concurrent boost versus standard whole breast irradiation plus sequential boost for early-stage breast cancer: https://www.nrgoncology.org/Clinical-Trials/Protocol/rtog-1005?filter=rtog-1005 (*requires access via NCI CTSU website*)
- MROQC Physics & Dosimetry Resources; see References; Heart Atlas for Breast Cancer
- eContour