

Radiation Oncology Workflow & Role of a Medical Dosimetrist

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Introduction

- Once a patient has decided to undergo radiation therapy, the patient will be scheduled for a “start date” to begin his/her course of treatment.
- Before the patient actually begins treatment, a series of steps must be executed on the side of the radiation staff which may be conceptualized by this flow chart:

Introduction Cont.



SIMULATION



PLANNING



QUALITY ASSURANCE



TREATMENT

Simulation



SIMULATION



PLANNING



QUALITY ASSURANCE



TREATMENT

Simulation Cont.

- For simulation, the patient will receive a CT scan in only the region of interest.
 - I.e., the cancerous site, meaning that for a breast case, the pelvis will not be included as part of the scan.
- The simulation is performed by the radiation therapists who are the individuals that operate the treatment machines and those who the patients will encounter on a daily basis.

Simulation Cont.

Three objectives of simulation:

1. To acquire a CT scan for treatment planning.
2. To position the patient in such a way that will allow for the use of desired treatment techniques.
3. To position the patient such that the same position may be reproduced for treatment day.

Click link(s) for visual aides: [Image 1](#) [Image 2](#) [Image 3](#)

Simulation Cont.

The therapists will position the patient on the CT table, most commonly in the head first-supine position, and use immobilization devices to reduce patient motion and to recreate simulation positional conditions for treatment day.

- Examples of immobilization devices include thermoplastic face masks for brain and head and neck cases, and vac-locs for lung and pelvis cases.

Click link(s) for visual aides: [Image 4](#) [Image 5](#) [Image 5](#) [Image 6](#)

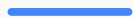
Simulation Cont.

- The therapists will also make markings using “dot” tattoos or stickers on the patient’s body, or permanent markers on the immobilization devices for alignment purposes.
 - Markings are made using the lasers in the simulation room which are also present in the treatment room.
- Thus, when the patient is positioned using the immobilization devices and aligned to these markings, the patient’s position can be reliably reproduced from one day to the other.

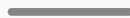
Planning



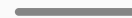
SIMULATION



PLANNING



QUALITY ASSURANCE



TREATMENT

Planning Cont.

- The therapists will transfer the CT scan images over to the treatment planning system.
 - A traditional x-ray image is viewed in two dimensions, but a CT scan is viewed in three dimensions.
- A CT scan may be understood by the following analogy:
 - Picture a long sub sandwich/sushi roll that is cut into multiple pieces or “slices”.
 - If one slice of that sandwich were to be held vertically, its contents or “anatomy” can be seen which is specific to that particular cut.

Click link(s) for visual aides: [Image 11](#) [Image 12](#) [Image 13](#) [Image 14](#)

Planning Cont.

- This thought process can be used to understand a CT scan in which the region that was scanned is also viewed slice-by-slice.
- The treatment planning step begins with contouring.
 - The physician will draw or “contour” the cancerous regions using the tools provided by the treatment planning system.

Click link(s) for visual aides: [Image 15](#) [Image 16](#)

Planning Cont.

- Referring back to the analogy of the sub sandwich, depending on where that cut is made with respect to the body, the anatomy displayed by the slice will reflect that.
 - For example, if a cut is made in the thoracic region, that slice will display organs such as the heart and lungs.
 - Slices above this cut is in the direction of head and slices below this cut is in the direction of the feet.
 - Thus, the physician is able to “scroll” through the slices, i.e., view the slices in the direction of the head and the feet to contour the full extent of the cancer.

Planning Cont.

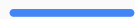
- The dosimetrist will also contour the nearby organs which surround the cancerous areas to minimize and track the radiation dose to these structures.
- Once all the contouring is complete, the dosimetrist will generate a treatment plan, and the algorithms of the treatment planning system will allow for an accurate prediction of the radiation dose to the cancerous regions and the surrounding organs.

Click link(s) for visual aides: [Image 16](#) [Image 17](#) [Image 18](#) [Image 19](#)

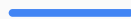
Quality Assurance



SIMULATION



PLANNING



QUALITY ASSURANCE



TREATMENT

Quality Assurance Cont.

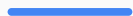
- After the physician has reviewed and approved the plan, the radiation dose predicted by the treatment planning system will be tested using the treatment machines by using radiation detectors.
- This is the Quality Assurance step and serves as a double check to verify that the generated treatment plan is feasible.

Click link(s) for visual aides: [Image 20](#) [Image 21](#)

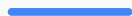
Treatment



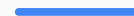
SIMULATION



PLANNING



QUALITY ASSURANCE



TREATMENT

Planning Cont.

- Lastly, the patient will arrive for treatment on his/her scheduled start date, and will be positioned on the treatment table following the same methods conducted during simulation.
- Depending on the physician's prescription dosage of radiation, the patient may return daily for multiple weeks to receive treatment.

Click link(s) for visual aides: [Image 22](#) [Image 23](#)

Thank you

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