# Optimization of Imaging Protocol for IG (RT)

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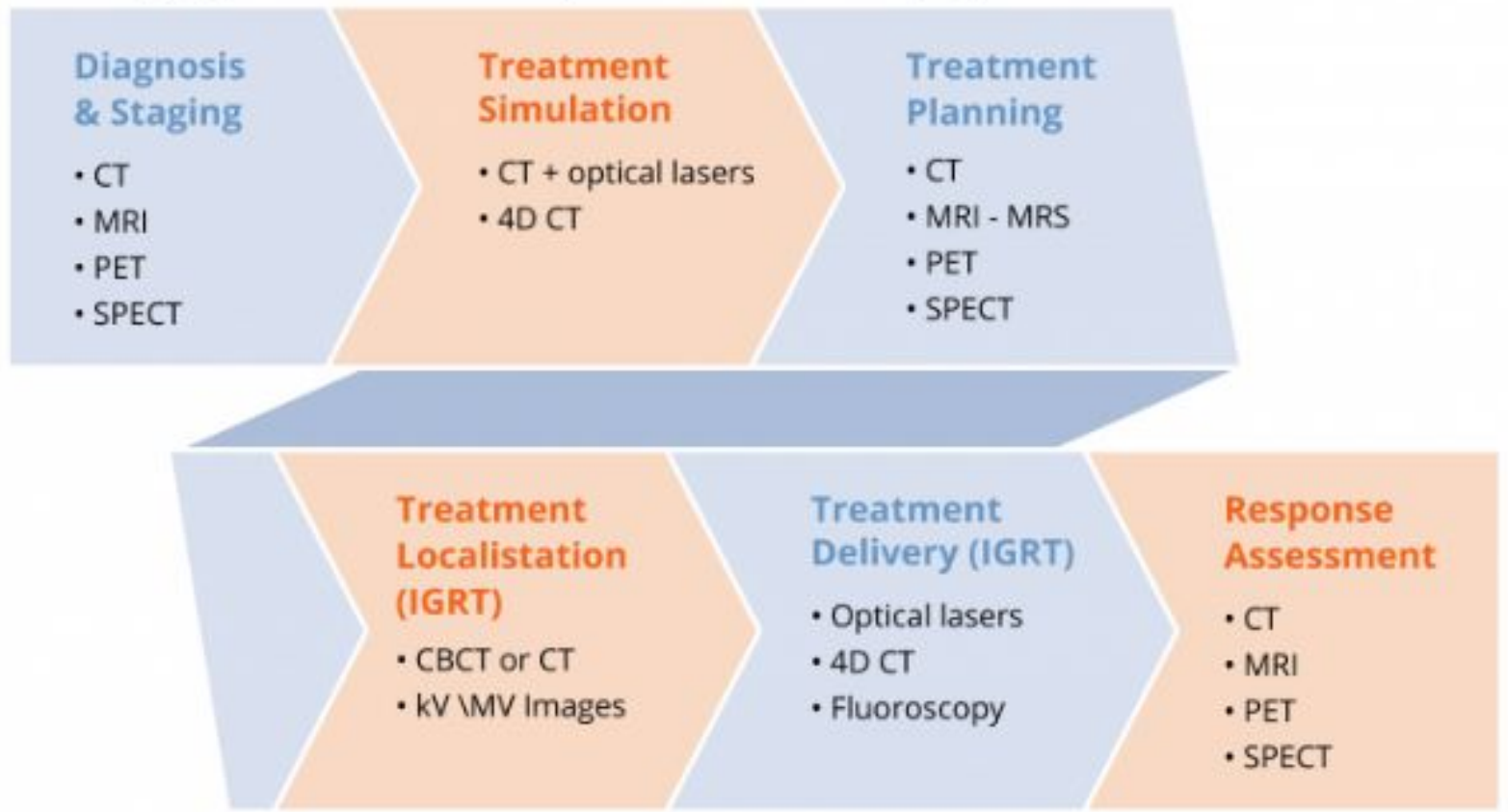
# Imaging phase in RT




- IGRT may involve a variety of 2D, 3D and 4D imaging techniques to position your body and aim the radiation so that your treatment is carefully focused on the target.
- This helps to minimize harm to healthy cells and organs nearby.
- During IGRT , imaging tests are done before, and sometimes during, each treatment session.

# Motion management

- **Intra-fraction motion**
  – during the fraction

✓ Heartbeat
✓ Swallowing
✓ Coughing
✓ Eye movement

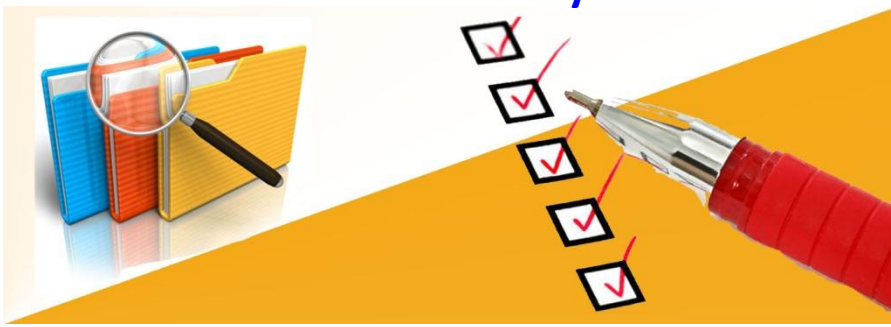
- **Inter-fraction motion**
  - in between the fractions

✓ Tumor change
✓ Weight gain/loss
✓ Positioning deviation

✓ **Breathing**

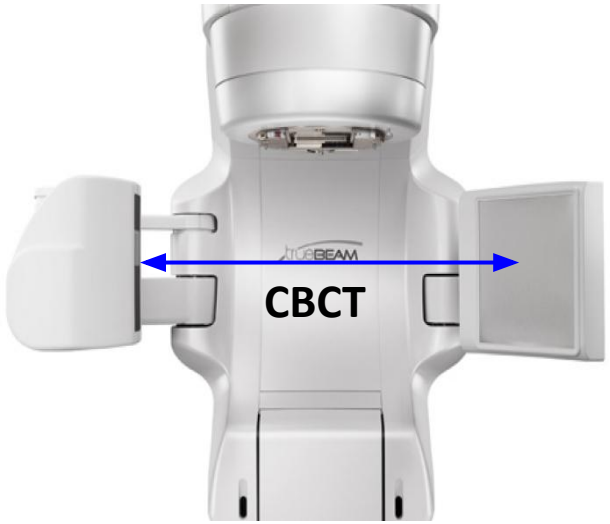
✓ Bowel and rectal filling
✓ Bladder filling
✓ Muscle relaxation/tension

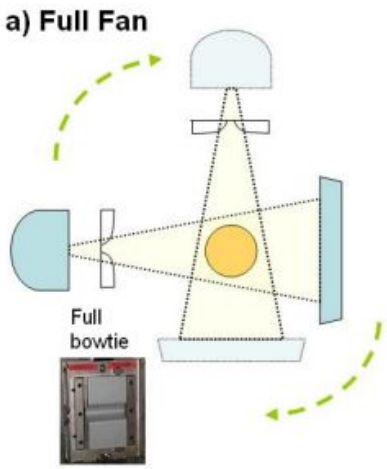
**Tx check list on daily basics**

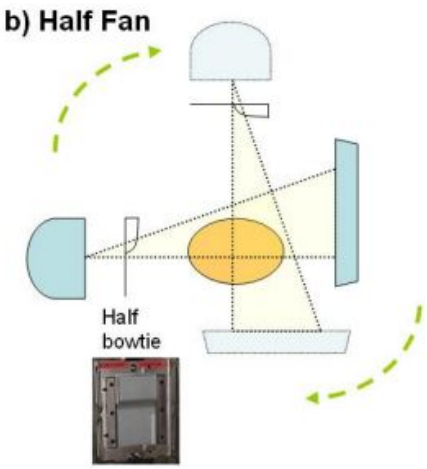


# CBCT exposure

| Full-Fan | Half-Fan |
| --- | --- |
| FOV – 24 cm | Recon FOV – 45 cm |
| Skull and H&N | Body scans |
| 1 mm to 5 mm | 1 mm to 5 mm |



# CBCT exposure settings

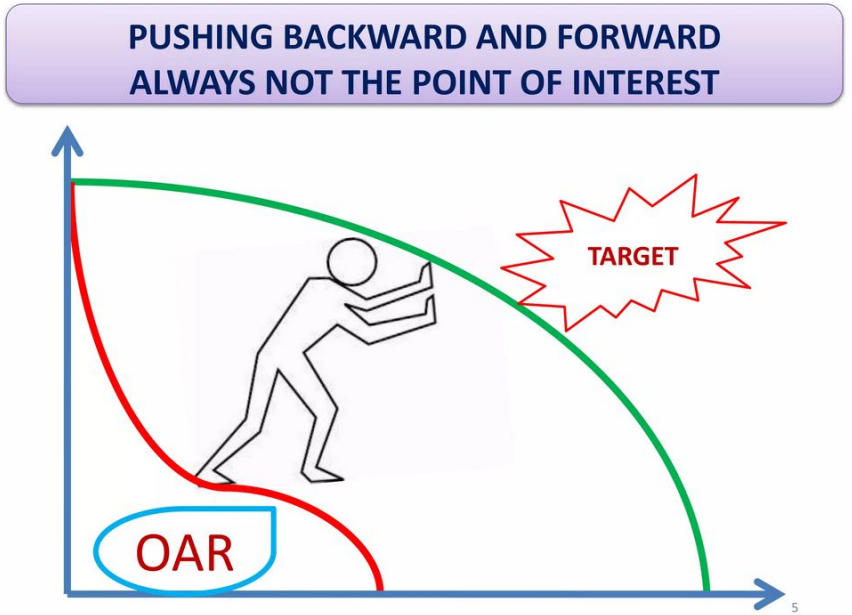
| CBCT FOV | FAN TYPE | TRAJECTORY | kV | mAs | $CTDI_{VOL}$ (mGy) | DLP (mGy. cm) |
|---|---|---|---|---|---|---|
| Head | FULL | HALF | 100 | 50 - 2825 | 1.06 – 59.69 | 22.6 – 1277.4 |
| | FULL | FULL | 100 | 90 - 5085 | 1.90 – 107.45 | 40.6 – 2299.3 |
| IMAGE GENTLY | FULL | HALF | 80 | 50 - 3150 | 0.47 – 29.70 | 10.1 – 635.7 |
| | FULL | FULL | 80 | 90 - 5670 | 0.85 – 53.47 | 18.1 – 1144.2 |
| PELVIS | HALF | HALF | 125 | 90 - 4050 | 1.33 – 60.07 | 28.5 – 1285.6 |
| PELVIS LARGE | HALF | FULL | 140 | 90 - 4050 | 1.96 – 78.45 | 42- 1679.5 |
| THORAX | HALF | FULL | 125 | 90-4050 | 1.33 – 60 .07 | 28.5 – 1285.6 |
| SHORT THORAX | FULL | LIMITED | 125 | 35 - 1575 | 0.57 - 25.89 | 12.3 - 554 |
| SPOTLIGHT | FULL | HALF | 125 | 50 - 2250 | 0.82 - 36.98 | 17.5 - 791.4 |
| | FULL | FULL | 125 | 90 - 4050 | 1.33 - 60.07 | 28.5- 1285.6 |

# kV / kV

| FOV | AREA | kV | mAs |
|---|---|---|---|
| Pelvis | SMALL | 84 - 122 | 3.07 - 11.72 |
| | MEDIUM | 84-122 | 50.12 -19.53 |
| | LARGE | 91 - 134 | 7.68 - 29.30 |
| | X-LARGE | 98 - 140 | 8.7 - 33.20 |
| HEAD | MEDIUM | 60 - 81 | 2.56 - 9.77 |
| THORAX ARM UP | SMALL | 84 - 122 | 2.56 - 9.77 |
| | LARGE | 98 – 140 | 2.56 – 9.77 |
| THORAX ARM DOWN | SMALL | 98 - 140 | 5.12 – 19.53 |
| | LARGE | 116 – 140 | 5.12 – 19.53 |
| ABDOMEN | SMALL | 69 - 95 | 5.12 – 19.53 |
| | LARGE | 84 - 122 | 6.66 – 25.39 |
| EXTERMITES | MEDIUM | 56 - 76 | 1.79 – 6.84 |

# CBCT Pt data

| Patient ID | P1 |
|---|---|
| Age / sex | 10 / Male |
| Dose per fraction | 180 cGy |
| Number of fractions | 28 |
| Total dose | 5040 cGy |
| Number CBCT Acquired during over all treatment | 10 |
| X-Ray tube Voltage | 100 kV (Default Value) |
| X- Ray tube current | 15 mA (Default Value) |
| Exposure | 150 mAs (Default Value) |
| Exposure Time | 10 sec (Default Value) |
| Source To Detector Distance | 150 CM (Default Value) |
| $CTDI_{VOL}$ | 3.17 mGy |
| DLP | 67.7 mGy.cm |
| Reconstruction Slice Thickness | 2 mm |



# Paediatric Imaging Protocol

| S. No | Treatment site | Imaging frequency | Remarks |
|---|---|---|---|
| 1 | Brain tumor with IMRT or SRT | Daily CBCT | - |
| 2 | Brain and other central nervous system (CNS) | Twice in a week CBCT<br>Daily kV | Based on Institutional practice - Daily CBCT |
| 3 | CSI | Daily CBCT mandatory | - |
| 3 | Leukemia – TBI - kV imaging based on Institutional practice | | |
| 4 | lymphomas | Alternate day CBCT<br>Daily kV | Based on site |

# IGRT

**Image Acquisition**. The IGRT system should be calibrated to ensure high imaging quality with attention to slice thickness uniformity, image contrast, spatial resolution, isocenter alignment between imaging and treatment planning and delivery systems, accuracy of software used for identification, and correction of couch misalignments. Relevant QA procedures should ensure reliability and reproducibility of the entire process.

**Treatment Verification**. Image review by radiation oncologist at the first fraction and then periodically is necessary to ensure treatment accuracy and reproducibility. Each department should determine its own threshold of couch positioning changes that would necessitate setup review or change before treatment delivery.

**Quality Assurance and Documentation**. A documentation of all the necessary QA procedures throughout the course of simulation, treatment, and periodic verification should be maintained. These would help determine departmental thresholds for action as well as serve as guides for modification of the processes involved following review of findings.