



Coding RT Treatments: Head & Neck (H&N)

NAACCR

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General overview of H&N cancers

- Oropharynx includes soft palate, tonsils, BOT, pharyngeal wall,
- 3:1 male: female ratio for oropharyngeal cancer,
- Incidence of HPV+ oropharyngeal cancers increase,
- HPV-associated oropharyngeal squamous cell carcinoma (OPSCC) w/ good prognosis (p53 not mutated),
- First drainage level for most of oropharynx: Level II, jugulodigastric lymph nodes (~ 70% of pts dx'd w/ SCC of oropharynx present w/ clinically+ LNs),
- HPV+ SCC of oropharynx most commonly found in nonsmokers, nondrinkers,
- Most common histologies:
 - SCC (~90%)
 - Non-Hodgkin's lymphoma



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Management of H&N cancers

- ChemoRT effective, but w/ significant acute & long-term toxicities,
- **EGFR** overexpression in ~ 90% of HNSCC (H&N Squamous cell carcinoma),
- **Cetuximab**, only EGFR inhibitor USDA approved for treatment of HNSCC, for locoregional dz,
- **Cetuximab** approved as first-line txt for recurrent or metastatic HN cancer in combination with chemo (platinum-based),
- Cisplatin + EBRT still the standard of care for HNSCC,
- T1, RT= ~66 Gy
- >T1, RT= 70 Gy (parotid glands to get no more than 20-26 Gy to avoid permanent xerostomia).



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Suspicious Lymphatics in H&N Cancer

- LN transverse diameter > 10 mm (5-8 mm for retropharyngeal LNs, Level VIIa, & 12-15 mm for upper jugular LNs, Level II),
- Central necrosis, regardless of size,
- Rounded shape vs. oval shape,
- Evidence of extracapsular spread,
- 3 or more LNs sized 6-8 mm grouped.



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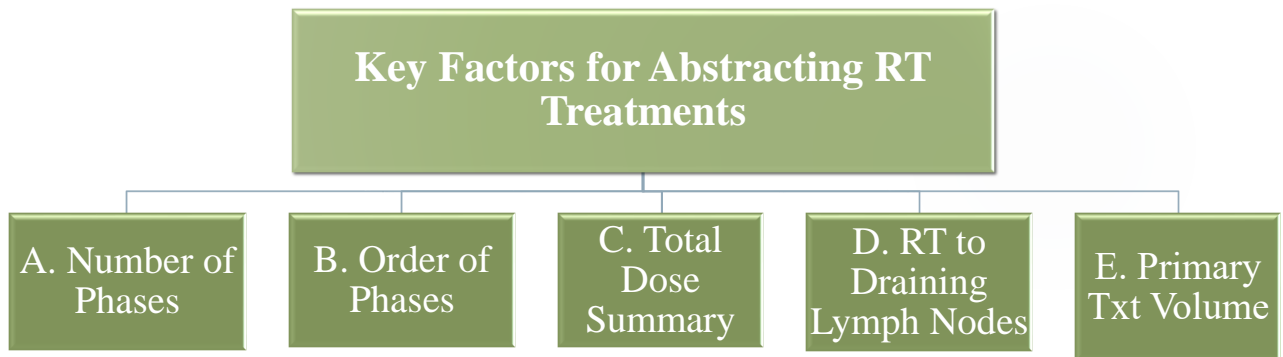
Acute effects of RT on H&N patients

- a. **Xerostomia:** best managed by use of IMRT/VMAT planning techniques, which minimize dose to organs at risk (OARs). Improves over time, even beyond a year post RT, but rarely returns to baseline. De-intensified CRT (ChemoRT); 60 Gy IMRT w/ concurrent wkly low-dose cisplatin may decrease txt-related toxicities,
- b. **Oral mucositis (OM):** can be managed by intra-oral **photobiomodulation (PBM)**, which involves use of low dose laser treatments; also referred to as low-level light therapy (LLLT),
- c. **Osteoradionecrosis:** ~ 6%
- d. **Peg tube dependency:** 15-20%



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Number of Phases



Note: Any one of these changes can result in a new phase



Number of Phases- Example 1

A. Change in Target Volume (SIB: Simultaneous Integrated Boost):

Txt Site	Energy	Dose/fx	Total dose	Start date	End date
PTV70, LT tonsils/LNs	6MVX	200	7000	9/11/18	10/30/18
PTV63, high risk region	6MVX	180	6300	9/11/18	10/30/18
PTV54, neck nodes	6MVX	154	5390	9/11/18	10/30/18

Number of Phases? **3 Phases**



Number of Phases- Example 2

B. Change in Target Site:

*Txt Site	Energy	Dose/fx	Total dose	Start date	End date
T12-L3 spine	6X	250 cGy	2500 cGy	3/4/19	3/15/19
Whole brain (WB)	6MV	300 cGy	3000 cGy	3/4/19	3/15/19

Number of Phases? **2 Phases**

• *Assuming metastatic sites are from same primary.*

• Which is Phase 1?? See Slide # 10



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Number of Phases- Example 3

C. Change in Planning Technique:

Txt Site	Energy, Technique	Dose/fx	Total dose	Treatment Modality	Planning Technique
Prostate	6X/IMRT	180 cGy	4500 cGy	02	05: IMRT
Prostate	I-125 Seed Implant		10,000 cGy	10: LDR, interstitial	88: NA

Number of Phases? **2 Phases**

What is total dose summary??



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ALERT!

Recent revision/addition to Order of Phases to the CRT Guide and STORE Manual



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“The Brief” Update

September 12, 2019

Instructions for coding multiple phases for radiation treatment

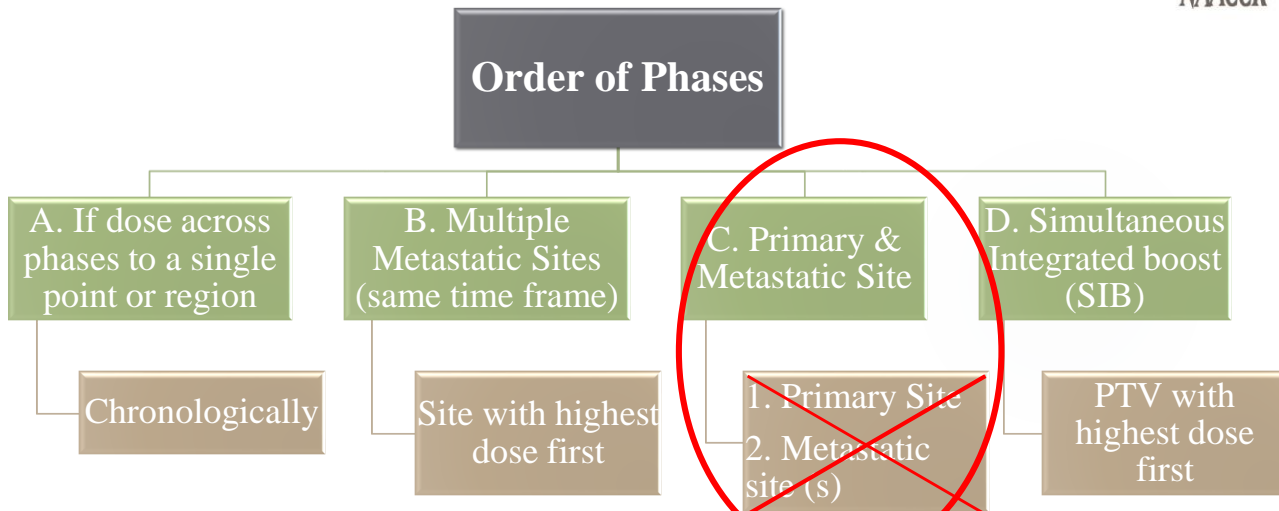
When a radiation treatment summary has multiple PHASES (aka delivered prescriptions):

- A.** Code the phases from the earliest to latest start date.
- B.** If there are multiple phases with the same start date, code the phases from highest to lowest total dose.
- C.** If there are multiple phases with the same start date and same total dose, then any order is acceptable.



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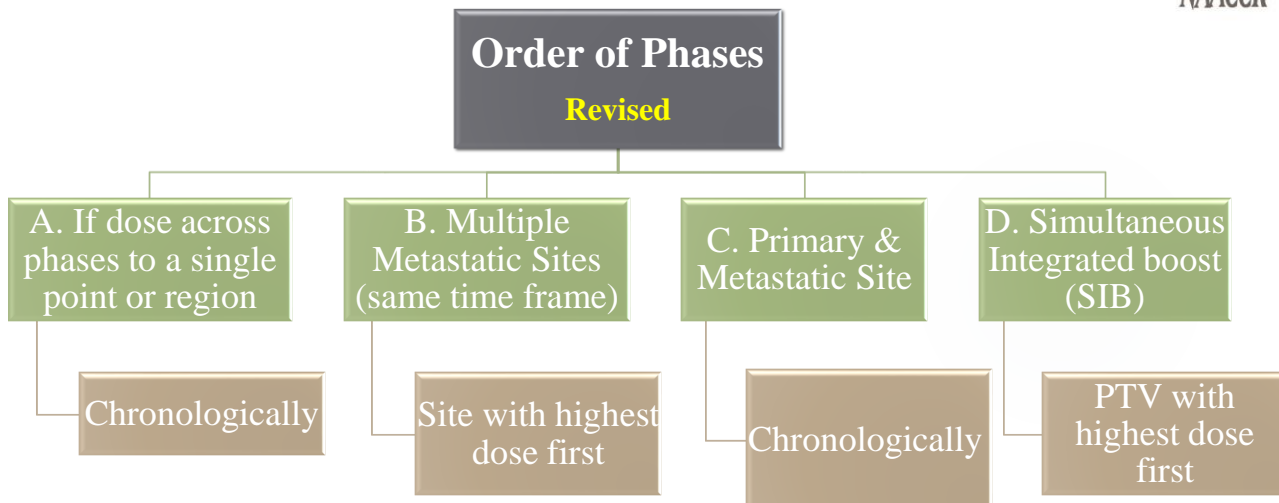
B. If multiple metastatic sites are treated at different time frames (1st course treatment), capture phases chronologically.

C. Metastatic sites chronologically, if at different time frames; site with highest dose first if metastatic sites treated @ same time frame. See "B".



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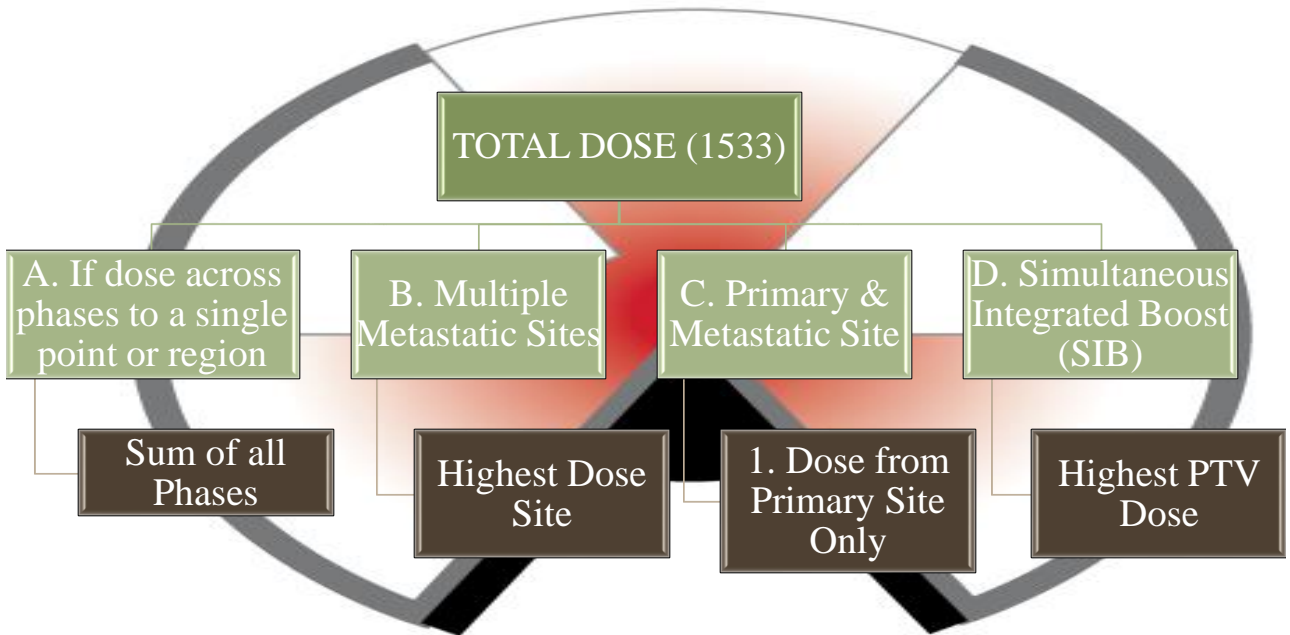
B. If multiple metastatic sites are treated at different time frames (1st course treatment), capture phases chronologically.

C. For sake of simplicity, it was determined that it is best to capture phases in chronological order, even if primary site is omitted due to the 3-phase limit (which is expected to be a rare occurrence).



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Radiation Therapy to Draining Lymph Nodes



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Key Points

1. SBRT does not target lymph nodes,
2. IORT for breast cancer does not target lymph nodes,
3. Chest wall or lumpectomy **tumor bed/cavity boost** (either photons or electrons) does not include lymph nodes,
4. For pelvic sites, if pelvic/whole pelvis irradiation is mentioned, assume the regional lymph nodes for that site are included,
5. Interstitial or intracavitary brachytherapy(HDR or LDR) does not target regional lymph nodes



ALERT!

Upcoming revision/addition to Dose/fx and Total Dose for brachytherapy procedures!

Look for upcoming update in The Brief.

Will also be added to the revised CRT Guide and STORE manual

Not yet in effect. You can continue to use current rules/guidelines as found in CRT Guide

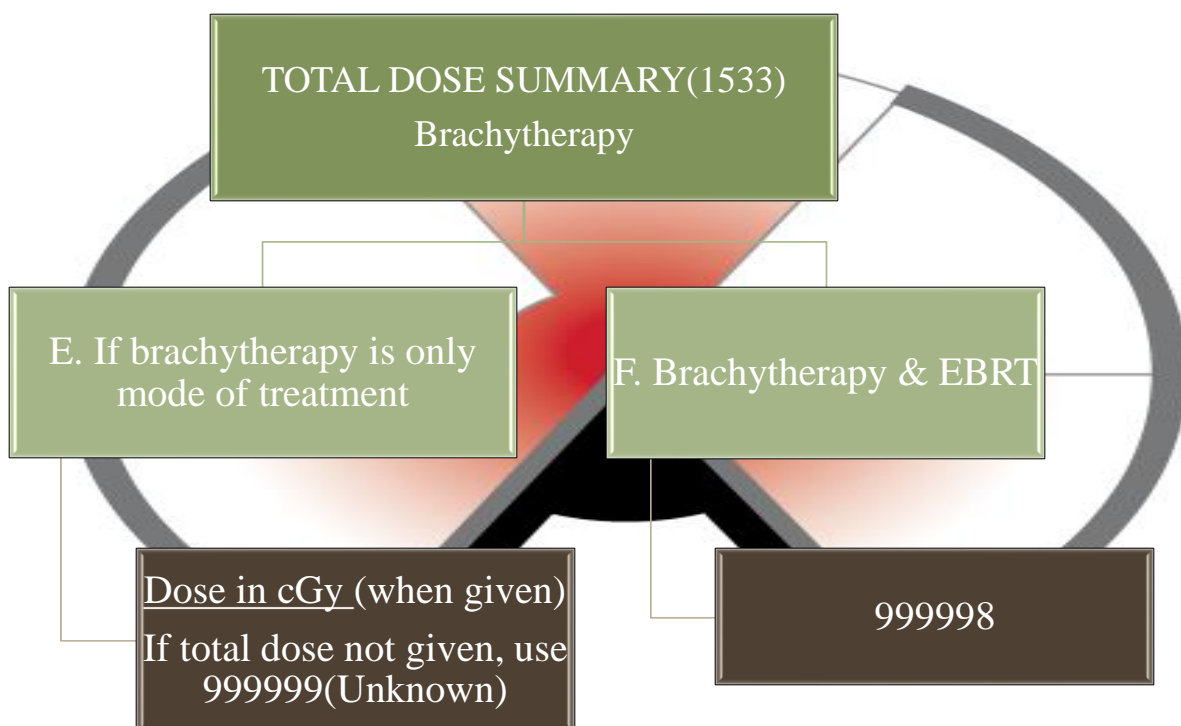


ALERT!

If dose/fraction and total dose is provided in Gy or cGy units *for any brachytherapy procedure*, capture this information in your abstract. Do not use codes 99998 or 999998 if this information is found in treatment summary!

If brachytherapy is only mode of treatment and dose is not provided in cGy, code to 999999 for total dose.

You **cannot**, however, add dose from EBRT phase to that of brachytherapy phase to get total dose!



Total Dose E: Example 1

E: If brachytherapy is only mode of txt= Dose in cGy when given.

RT Summary:

Using a 6/1 mini SAVI catheter, RT lumpectomy cavity received 34 Gy in 10 treatments, BID.

Plan ID	Energy	Fx	Dose/fx (cGy)	Total Dose (cGy)	Start Date	End Date
RT breast	SAVI catheters (Ir-192)	10	340	3400		

Number of Phases of Rad Treatments (01) 1 phase

RT Discontinued Early (01) RT completes as prescribed

Total Dose (003400)



Total Dose F: Example 1

F: Brachytherapy + EBRT: Total dose summary = 999998.

Plan ID	Energy	Fx	Dose/fx (cGy)	Total Dose (cGy)	Start Date	End Date
Pelvis, Cervix	6MV/VMAT	25	180	4500	5/3/18	7/26/18
Cervix	Ir-192 HDR brachy	6	400	2400	7/11/18	7/26/18

Number of Phases of Rad Treatments (02) 2 phases

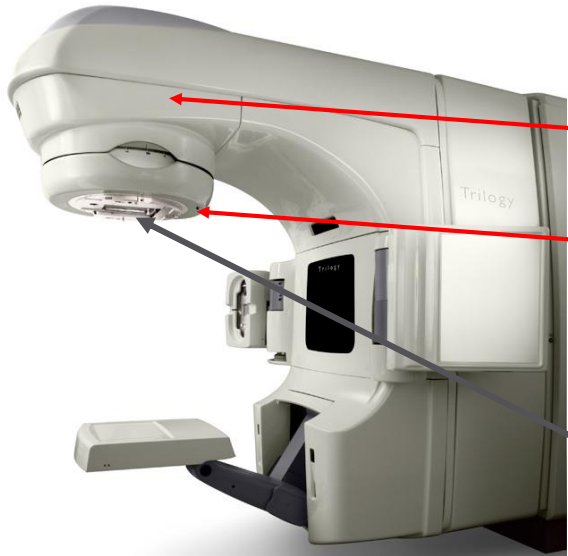
RT Discontinued Early (01) RT completes as prescribed

Total Dose (999998)



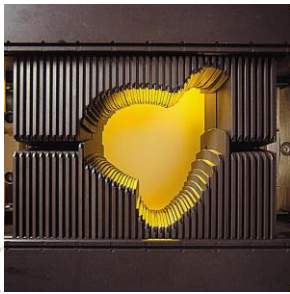
Note: Total dose for Phase 2 (brachy) will be entered as 002400

Linear Accelerator-Linac



Gantry

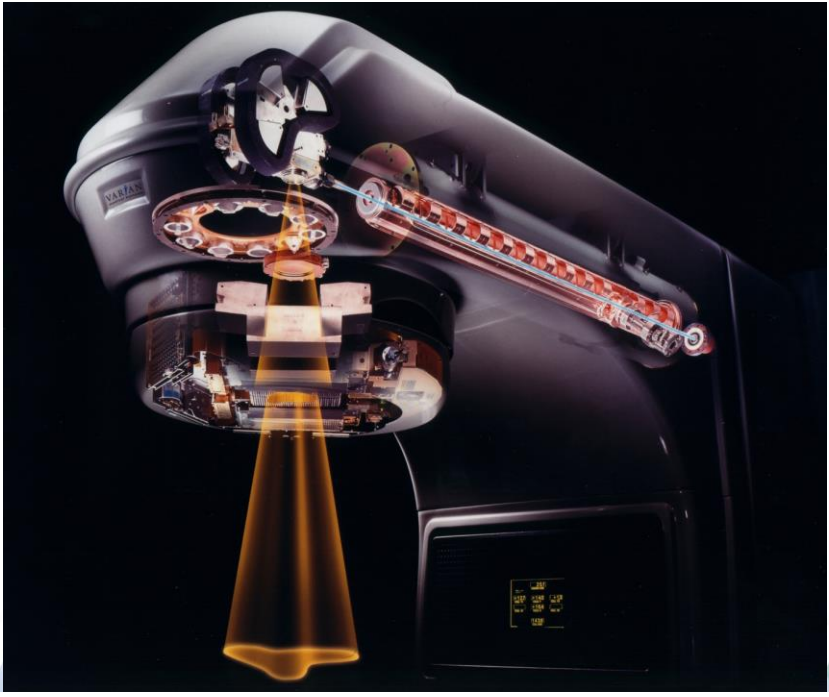
Collimator



Collimator leaves



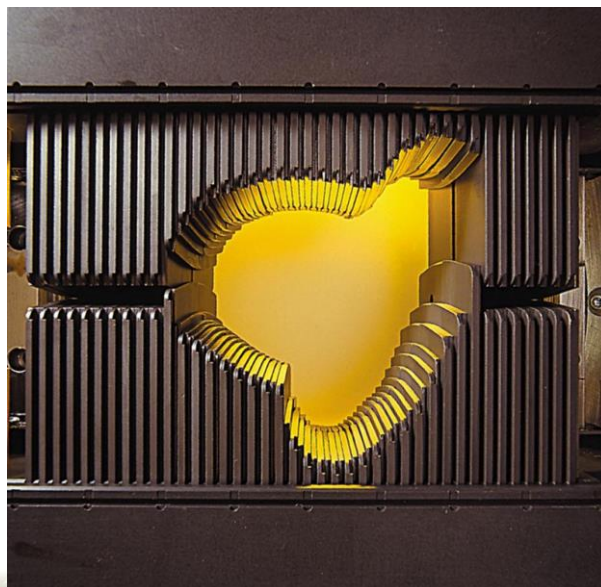
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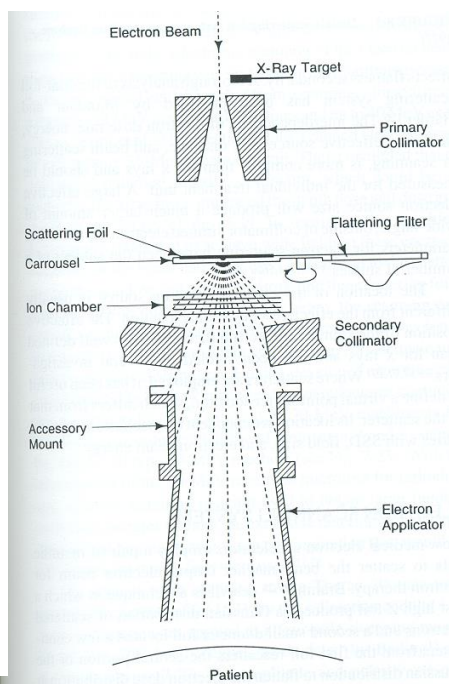
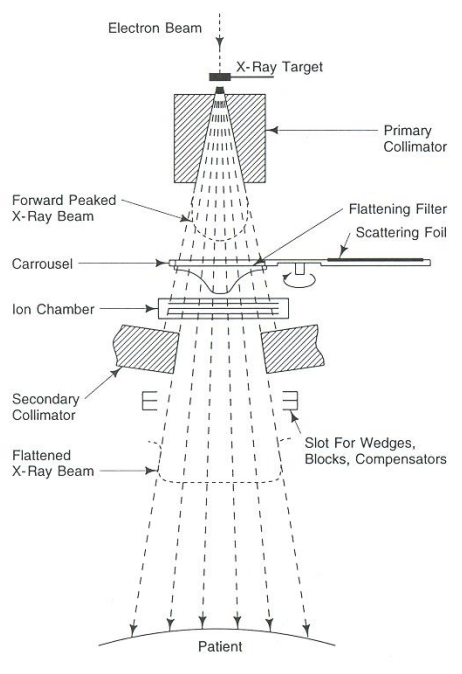
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Dynamic multi-leaf collimators



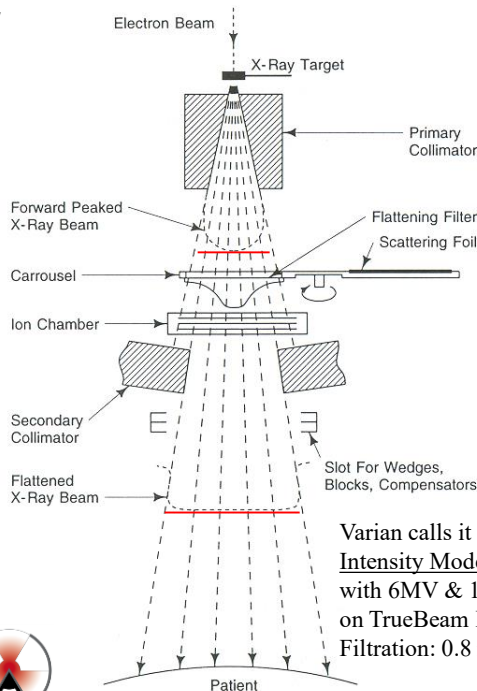
Most modern Varian Linacs are equipped with 120 DMLC leaves.



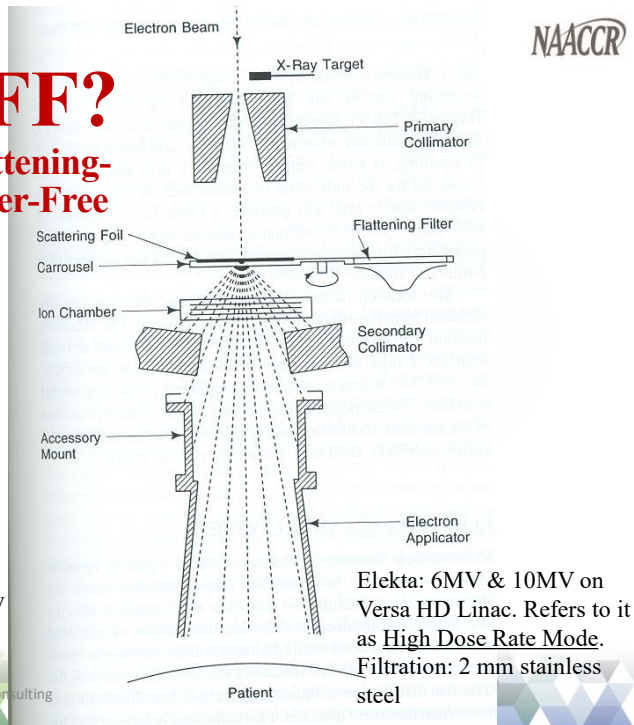
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FFF?

Flattening-Filter-Free



Varian calls it High Intensity Mode. Available with 6MV & 10MV energy on TrueBeam Linacs.
Filtration: 0.8 mm brass



Elekta: 6MV & 10MV on Versa HD Linac. Refers to it as High Dose Rate Mode.
Filtration: 2 mm stainless steel

WHA Consulting



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Flattening-Filter-Free (FFF)

Since there nothing in the path of the beam, there is no attenuation of the beam and hence we end up with a higher dose rate.

A high dose rate delivery of radiation means that the treatment time can be reduced significantly.

The limitation is that since the photon beam is not as uniform (flat) as it would be with a flattening filter, we are limited to the field size we can treat, typically very small targets (such as those targeted by SBRT, which limits the targets to no greater than 5 cm).

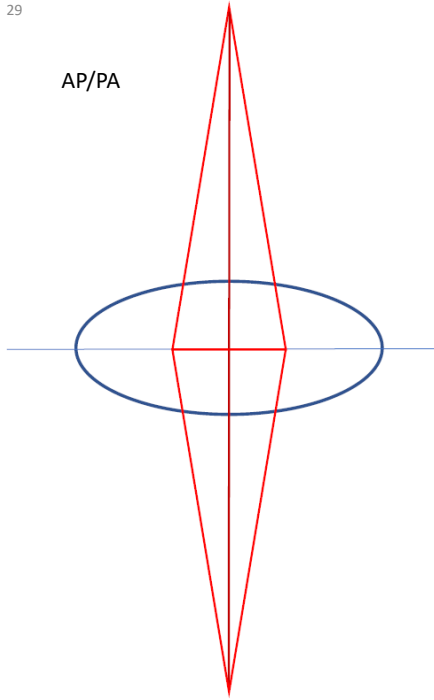
However, modern linacs can use IMRT planning techniques to “flatten” the beam in the absence of a conventional flattening filter.



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AP/PA

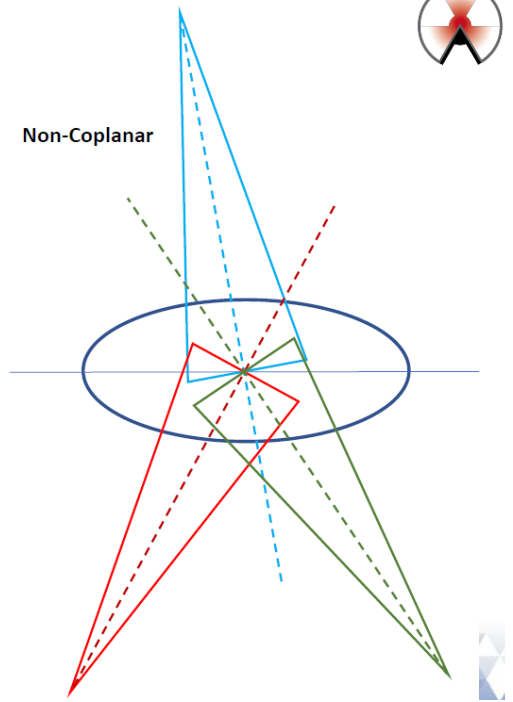


Coplanar beams: Central axes of pairs of radiation beams overlap, such as in AP/PA or RL/LL fields.

Non-coplanar beams: Central axes of multiple beams do not overlap; reduces dose to healthy tissues, thereby reducing the likelihood of short-term & long-term radiation-induced toxicities.



Non-Coplanar



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Treatment Summary states that a 6 MV beam energy was used. What does it really mean?



- a. All photons on beam have energy of 6 MV
- b. The average photon energy of the beam is 6 MV
- c. The maximum photon energy of the beam is 6 MV
- d. The minimum photon energy of the beam is 6 MV



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CLINICAL CASES



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Clinical Scenario 1: BOT H&N

Patient is a 66 y/o w/f with history of nodular goiter who was being evaluated as part of routine surveillance when a LT level II cervical node was noted on neck ultrasound. Pt denies feeling any neck fullness or palpable neck mass. Laryngoscopy revealed a 1.5 cm BOT mass.

11/7/19: Needle bx of suspicious node= poorly differentiated squamous cell carcinoma, negative for p16.

12/6/18: BOT bx= positive for malignancy, squamous cell carcinoma.

Pt opted for concurrent chemotherapy with cisplatin + EBRT.



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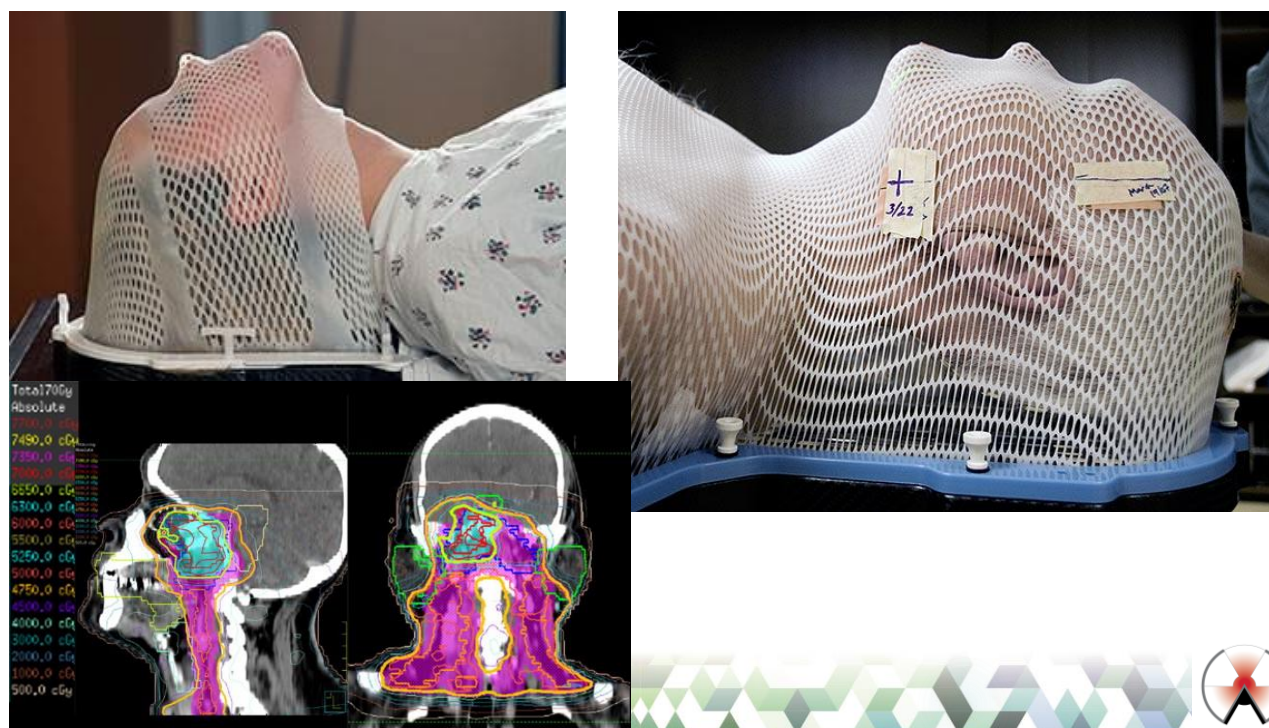
Clinical Scenario 1: BOT H&N

Radiation Therapy Summary:
IMRT & VMAT delivery used.

Treatment site	Energy	Dose/fx	# of fx	Total dose	Start date	End date
BOT/Neck	6X	200	35/35	7,000	1/29/19	3/19/19



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Case 1

Seg	#	Field	Code/Definition
Summary	1	Rad/Surg Sequence	0 No radiation and/or sur
	2	Reason No Rad	0 Radiation was admin..
	3	Location of Rad	1 All RT at this facility
	4	Date Started/Flag	01/29/19
	5	Date Finished/Flag	03/19/19
	6	Number of Phases	01
	7	Discontinued Early	01 Radiation completed
	8	Total Dose	007000
Phase 1	9	Volume	22 Oropharynx
	10	Rad to Nodes	01 Neck lymph node regions
	11	Modality	02 External beam, photons
	12	Planning Technique	05 IMRT
	13	Number of Fractions	035
	14	Dose per Fraction	00200
	15	Total Phase 1 Dose	007000
Phase 2	16	Volume	00
	17	Rad to Nodes	
	18	Modality	
	19	Planning Technique	
	20	Number of Fractions	
	21	Dose per Fraction	
	22	Total Phase 2 Dose	
Phase 3	23	Volume	
	24	Rad to Nodes	
	25	Modality	
	26	Planning Technique	
	27	Number of Fractions	
	28	Dose per Fraction	

Case 1 Rationale:

#6: Very straightforward case. In a single phase, the primary site (BOT) and the regional LNs were targeted.
#9: The BOT is found in the oropharynx.
#10: Neck nodes also irradiated in this phase.

Note: VMAT (Volumetric Modulated Arc Therapy) is a form of rotational therapy, which requires IMRT planning technique.



Clinical Scenario 2: BOT p16+

53 y/o w/f with h/o GERD HTN, who presented to her PCP with a palpable neck mass. Pt is non- smoker. Social etoh

Pt completed RT tx w/ concomitant chemo for Stage II (T1N2M0) SCC of the BOT. For setup, pt was supine on tx table and an Aquaplast mask was made for immobilization. CT-based planning was used to design a VMAT beam arrangement to treat H&N. Tx plan called for 3 arcs: arc 1 from 184 to 176 degrees, arc 2 from 176 to 184 degrees, and arc 3 from 184 to 176 degrees. The CTV-1 included BOT lesion and involved LNs and was tx @ 200 cGy/day to 7000 cGy with the dose delivered at the 94% isodose.



Clinical Scenario 2: BOT p16+...

53 y/o w/f with h/o GERD HTN, who presented to her PCP with a palpable neck mass. Pt is non- smoker. Social etoh

The CTV-2 was the remainder of the upper and mid-neck nodes, and treated at 180 cGy/day to 6300 cGy. The CTV-3 encompassed bilateral low neck and supraclavicular nodes, and was treated at 160 cGy /day to 5600 cGy. Daily cone beam CT was done prior to tx to confirm setup. Pt also received concomitant chemo with Cisplatin.



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Clinical Scenario 2-SIB/VMAT Treatment

Treatment site	Energy	Dose/fx	# of fx	Total dose (cGy)	Start date	End date
CTV-1-BOT/LNs	6X	200	35/35	7,000	10/22/18	12/14/18
CTV-2-Upper/Mid Neck LNs	6X	180	35/35	6,300	10/22/18	12/14/18
CTV-3-Bilat low neck/SCV	6X	160	35/35	5,600	10/22/18	12/14/18

Treatment Modality = 02: external beam, photons

Planning Technique = 05: IMRT



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Clinical scenario 2- H&N w/ SIB-VMAT...

When Simultaneous Integrated Boost (SIB) is used, the regional dose along with the boost doses are delivered *at the same time every day*.

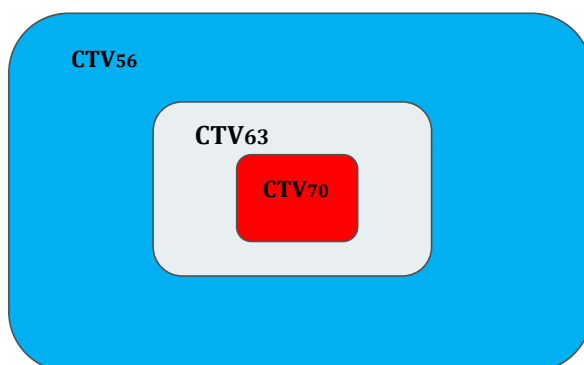
This is why each phase consists of 35 fractions.

The field size is basically reduced to deliver the boost on a daily basis.



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Simultaneous Integrated Boost (SIB)



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Case 2

Seg	#	Field	Code/Definition
Summary	1	Rad/Surg Sequence	0 No radiation and/or sur
	2	Reason No Rad	0 Radiation was admin..
	3	Location of Rad	1 All RT at this facility
	4	Date Started/Flag	10/22/18
	5	Date Finished/Flag	12/14/18
	6	Number of Phases	03
	7	Discontinued Early	01 Radiation completed
	8	Total Dose	007000
Phase 1	9	Volume (CTV1_70Gy)	22 Oropharynx
	10	Rad to Nodes	01 Neck lymph node regions
	11	Modality	02 External beam, photons
	12	Planning Technique	05 IMRT
	13	Number of Fractions	035
	14	Dose per Fraction	00200
	15	Total Phase 1 Dose	007000
Phase 2	16	Volume (CTV2_63Gy)	22 Oropharynx
	17	Rad to Nodes	01 Neck lymph node regions
	18	Modality	02 External beam, photons
	19	Planning Technique	05 IMRT
	20	Number of Fractions	35
	21	Dose per Fraction	00180
	22	Total Phase 2 Dose	006300
Phase 3	23	Volume (CTV3_56Gy)	22 Oropharynx
	24	Rad to Nodes	01 Neck lymph node regions
	25	Modality	02 External beam, photons
	26	Planning Technique	05 IMRT
	27	Number of Fractions	035
	28	Dose per Fraction	00160
	29	Total Phase 3 Dose	005600

Case 2 Rationale:

#6: Three CTV (or PTV) volumes = 3 phases.

#8: Always select highest PTV (CTV) dose as total dose.

#9: BOT located in oropharynx.

#13, 20, 27: When SIB is used, number of fx should be the same for all phases of SIB.

#10, 17, 24: As per treatment summary, all phases included regional lymphatics.

Note: Since all PTVs are treated simultaneously (SIB), order phases from largest delivered dose to lowest delivered dose.



Clinical Scenario 3: Quad Shot

73 y/o male with multiple comorbidities who presented with palpable neck mass bilateral.

Work up imaging and bx revealed a well differentiated squamous cell carcinoma of oropharynx.

Patient was treated using the Quad Shot RT technique.



Clinical Scenario 3: Quad Shot

RT treatment summary:

Site	Energy	Dose/fx	# of fx	Total dose	Start date	End date
Oropharynx, bilat LNs	6X	740 cGy	2	1,480 cGy	4/9/19	4/10/19
Oropharynx, bilat LNs	6X	740 cGy	2	1,480 cGy	4/30/19	5/1/19
Oropharynx, bilat LNs	6X	740 cGy	2	1,480 cGy	5/21/19	5/22/19

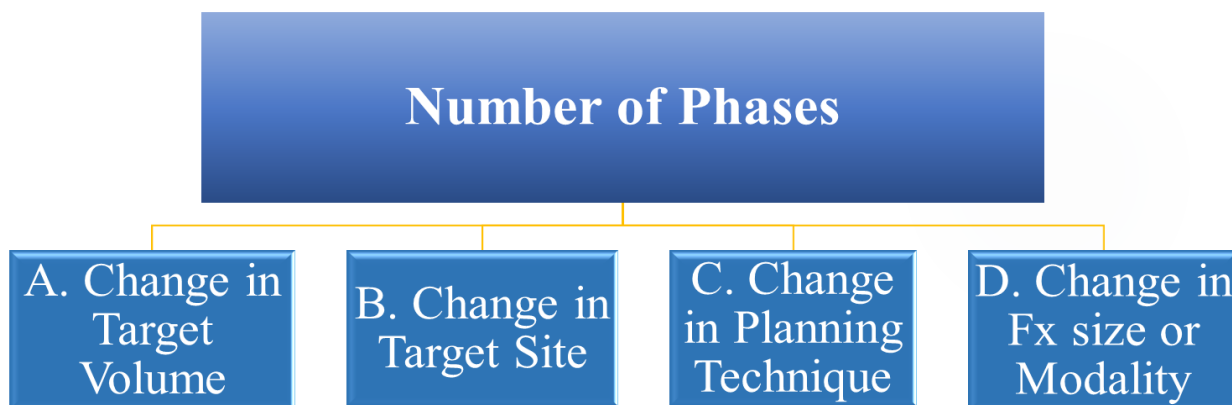
How many total fractions?

How many phases??



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Note: Any one of these changes can result in a new phase



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Quad Shot-Palliative RT

- First used in palliative RT for pelvic malignancies,
- Most common fractionation:
 - **370 cGy twice daily (BID)**, for two consecutive days (1,480 cGy), repeated every 3-4 weeks for a total of 4,400 cGy in 3 cycles.

Expect to see more hypofractionated RT prescriptions for H&N palliative treatments.



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Seg #	Field	Code/Definition
Summary	1 Rad/Surg Sequence	0 No radiation and/or sur
	2 Reason No Rad	0 Radiation was admin..
	3 Location of Rad	1 All RT at this facility
	4 Date Started/Flag	04/09/19
	5 Date Finished/Flag	05/22/19
	6 Number of Phases	01
	7 Discontinued Early	01 Radiation completed
	8 Total Dose	004400
Phase 1	9 Volume	22 Oropharynx
	10 Rad to Nodes	01 Neck lymph node regions
	11 Modality	02 External beam, photons
	12 Planning Technique	05 IMRT
	13 Number of Fractions	012
	14 Dose per Fraction	00370
	15 Total Phase 1 Dose	004400
Phase 2	16 Volume	00
	17 Rad to Nodes	
	18 Modality	
	19 Planning Technique	
	20 Number of Fractions	
	21 Dose per Fraction	
	22 Total Phase 2 Dose	
Phase 3	23 Volume	
	24 Rad to Nodes	
	25 Modality	
	26 Planning Technique	
	27 Number of Fractions	
	28 Dose per Fraction	

Case 3 Rationale:

- #6: Single phase delivered over a 3-4 week period,
- #11: 6X beam energy is indicative of EBRT in photon mode.
- #12: Quad shot typically delivered via an IMRT plan. Need to confirm with your facility.
- #12: Dose delivered BID (twice a day) in 6 days (3 cycles).



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More Questions

1. Should we ever expect to encounter a 2D planning technique for the management of a H&N primary for curative intent?
2. Treatment summary states the planning was with “Dose Painting”. How do I code that?
3. S-frame immobilization device used. Virtual simulation performed using 1 set of CT images to define PTV, OARs, localization. IMRT calculation completed using a SAD setup. Plan consisted of 7 non-coplanar x-ray beams with an energy of 6 MV. Dose-volume histogram was computed for this plan, verifying that 100% of planning target volume (PTV) was covered by prescribed dose of 6600 cGy. What information here is useful???



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Resources

- “Handbook of Evidence-Based Radiation Oncology”, 3rd ed. 2018 Edition
- “Principles and Practice of Radiation Therapy” 4th edition**
Excellent textbook.
Hard copy: \$191
Kindle edition: \$147
Consider a used copy



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Principles and Practice of Radiation Therapy, 4th Edition



Resources



- <https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards/Practice-Parameters-by-Subspecialty>

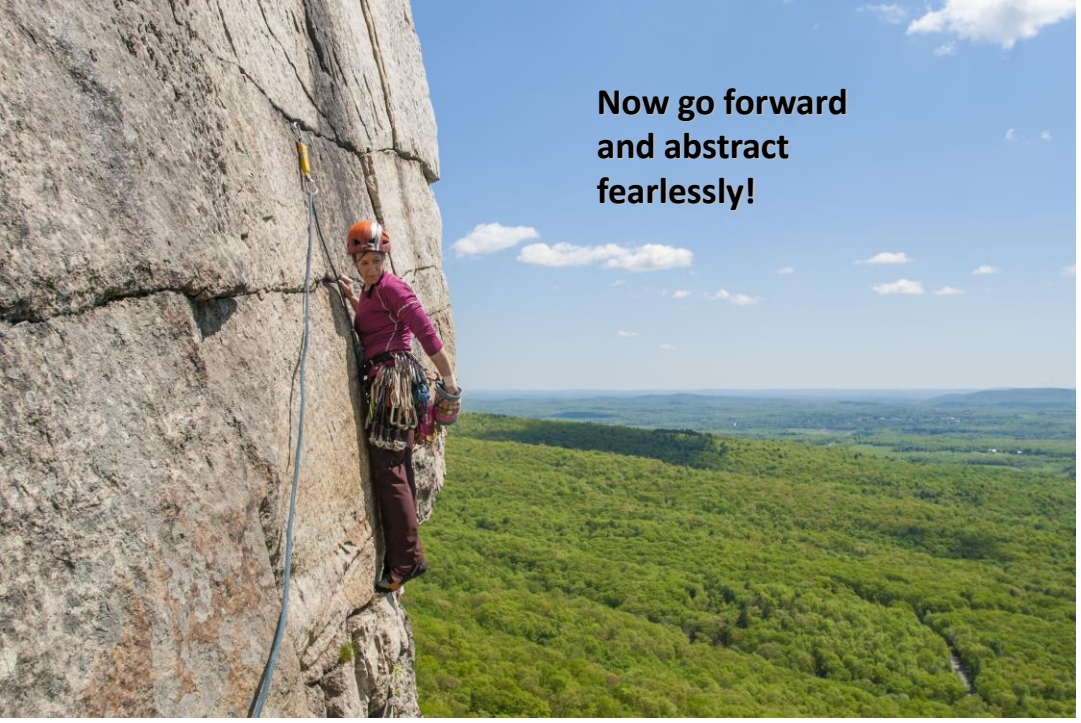
There are a couple of links you will find tremendously useful:

- Radiation Oncology: General
- Radiation Oncology: Radiation Therapy
- NCCN Guidelines-provides therapeutic dose range for most sites.





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