



2026 AAMD PLAN STUDY

CRANIOSPINAL WITH PRIOR XRT
HAND OUTS

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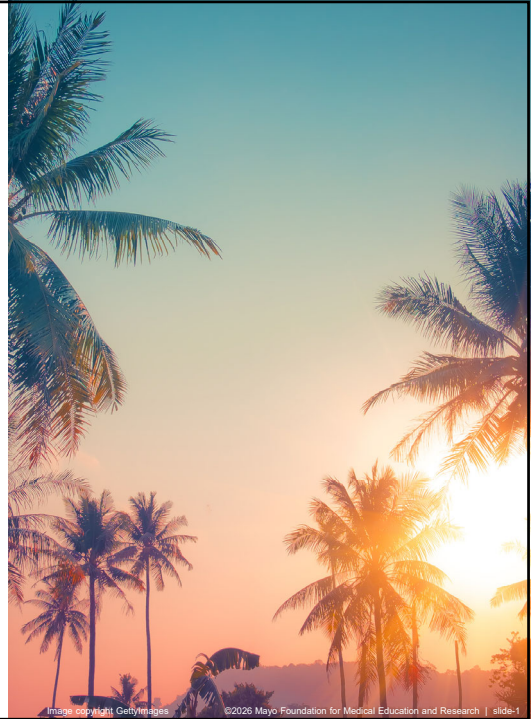


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PRESENTATION AGENDA

- Case Introduction
 - Patient Background
- Plan Challenge
 - Metrics
- Results
- Planning Tips and Tricks

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1 CASE INTRODUCTION

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CASE INTRODUCTION

PATIENT BACKGROUND

39 Y.O. FEMALE

- Metastatic triple negative breast cancer and later diagnosed symptomatic leptomeningeal disease via lumbar puncture
- Prior radiation treatment
 - 2 weeks prior to left femur and 9th ribs (3000 cGy/10fx)
 - Did not have meaningful overlap
 - 4 months prior to T1-T5 and T12-L1 (3000 cGy/10fx)
 - 6 months prior to L3-L4 spine and left pelvis (3000 cGy/10fx)

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CASE INTRODUCTION (HO)

NRG-BN014: A PHASE III RANDOMIZED CLINICAL TRIAL OF PROTON CRANIOSPINAL IRRADIATION VERSUS INVOLVED-FIELD RADIOTHERAPY FOR PATIENTS WITH BREAST CANCER OR NONSMALL CELL LUNG CANCER LEPTOMENINGEAL METASTASIS

- Why did the physician consider this protocol?
 - In the past, standard radiation treatment for symptomatic LMD consisted of treatment to individual symptomatic site(s) of disease (IFRT), which would be the brain. Additional sites would be determined based on additional imaging of the cervical and thoracic spine.
 - A phase 2 trial published by Yang et al. (JCO 2022) suggested that the use of pCSI is associated with improved central nervous system (CNS) progression free survival (PFS) when compared to IFRT. The study also suggested that there may be an overall survival (OS) benefit in patients who receive pCSI.
 - Physician needed to review a plan sum to determine the radiation dose received to her spinal cord and cauda equina. In the event that she is not eligible for the trial due to excessive dose to her spinal cord and/or cauda equina that she would also be a candidate for VMAT CSI
- Did the patient meet criteria?
 - Review of prior treatments found spinal cord maximum dose was > 40 Gy EQD2 (a/b = 3 Gy). This is an exclusion criteria for trial entry, so she was not a candidate for BN014
- Next steps?
 - Discussed VMAT CSI and WBRT alone as treatment options. Ultimately, patient chose VMAT CSI

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CASE INTRODUCTION

NRG-BN014: A PHASE III RANDOMIZED CLINICAL TRIAL OF PROTON CRANIOSPINAL IRRADIATION VERSUS INVOLVED-FIELD RADIOTHERAPY FOR PATIENTS WITH BREAST CANCER OR NONSMALL CELL LUNG CANCER LEPTOMENINGEAL METASTASIS

- Phase III clinical trial comparing proton craniospinal irradiation (pCSI) with standard involved-field radiotherapy (IFRT) in patients with breast cancer or non-small cell lung cancer that has spread to the leptomeninges (LM)
- The main goal is to see whether pCSI improves overall survival. Researchers will also evaluate:
 - how long cancer is controlled in the brain/spine,
 - treatment side effects
 - radiation-related toxicity
 - and patient quality of life
- LM is a serious condition with poor prognosis because cancer spreads throughout the brain and spinal cord. Standard radiation only treats selected areas, while pCSI treats the entire central nervous system using proton therapy, which may reduce toxicity.
- Earlier Phase I/II studies showed pCSI significantly improved CNS disease control and survival compared with standard radiation, with similar side effects. This Phase III study is designed to confirm those findings and potentially establish pCSI as a new standard treatment for LM.

Source: NRG Oncology. *NRG-BN014 Protocol*, Version Date July 2, 2025.

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CASE INTRODUCTION

PRESCRIPTION

- Craniospinal Treatment:
3000/2000 cGy in 10 fractions
 - PTV3000: cyan
 - Brain down to top of C7,
T7 to top of T11, bottom of
L5 through S3
 - PTV2000: maroon
 - Regions of prior palliative
treatment
 - C7 through T6, T11
through L5



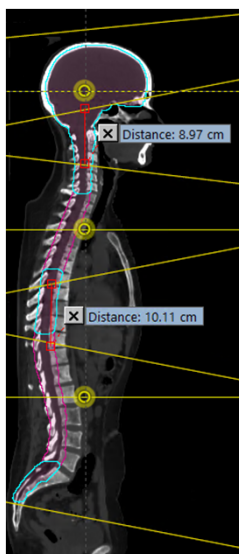
Target volumes: 20 Gy, maroon, 30Gy, cyan, (Eclipse) ©2026 Mayo Foundation for Medical Education and Research | slide-7

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CASE INTRODUCTION

CSI SOP: SET UP

- VMAT protocol
- 3-4 isocenters depending on overlap regions
 - Brain: centered to brain to maximize smaller MLC. Inferior jaw brought up to avoid treating through shoulders
 - Thorax: Maximize longitudinal jaws (20x20), maintaining a minimum 8 cm overlap with brain fields
 - Lumbar: Maximize longitudinal jaws (20x20), setting inferior edge to cover inferior most portion of PTV, maintaining a minimum 10 cm overlap with thorax fields
 - Optional 4th depending on patient size/shoulders impeding overlap
- Try to maintain couch vertical and lateral throughout isocenters- only require longitudinal shifts. NO COUCH ROTATIONS
 - Adjust if patient is extremely kyphotic or has scoliosis



Isocenter placement and field overlap (Eclipse)

- Utilize ARCs
 - Brain: 3-4 full ARC rotations (collimators 5°, 355°, 90°)
 - If 4 ARCs use additional 90° or 85° collimator
 - Spine: 4 partial ARC rotations, adjust starting position to avoid entering through kidneys/arms
 - ARC1: CW 115°-179°, collimator 5°
 - ARC2: CCW 179°-115°, collimator 355°
 - ARC3: CW 181°-245°, collimator 5°
 - ARC4: CCW 245°-181°, collimator 355°
- Adjust lateral jaws for each isocenter
- Prior to optimization, turn OFF jaw tracking for overlap regions
- Plan all isocenters together for optimization and separate out after for treatment

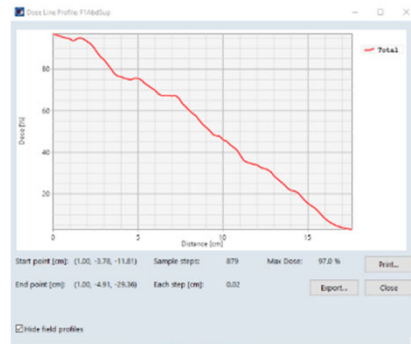
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CASE INTRODUCTION

CSI SOP: OPTIMIZATION

- Helpful structures
 - Dose limiting annulus (DLA):
 - 3 cm expansion from PTV then cropped 3 mm from PTV
 - Hot/Cold structures
 - After each optimization, create cold structures from isodose lines
 - Generally in overlap regions
 - After getting dose to fill in more, create hot structures to bring max hot below 110%
 - Zptv_OPT
 - In cases with prior treatment and nearby/overlapping OAR
- After planning, separate isocenters for treatment
- On each separate plan, check that the overlap regions demonstrate appropriate feathering with the dose profile tool
 - Profile should be roughly a 45 degree angle as shown



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CASE INTRODUCTION

CSI SOP: TREATMENT

- Once plan is approved, Physics completes standard plan check along with CSI specific checks
- Among those specific checks, physics completes a CSI Shift Calculator Document
 - Delta shifts are not used, necessary shifts are documented here
 - Setup notes indicate to utilize this document- this is the only place shifts will be documented for treatment
 - Document is interactive. Allows users to verify shifts based on couch position and setup each day of treatment
- RTTs also provide a check of documentation prior to patient treatment

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2 PLAN CHALLENGE

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PLAN CHALLENGE

CASE CRITERIA

- Proton, photon, and carbon ion clinically acceptable plans will be accepted for review
- A combination of VMAT/IMRT and 3D plans can be used
- A limit of 4 VMAT arcs/beams or 7 IMRT/3D beams can be used “Per Isocenter”
- A limit of 7 proton beams can be used
- A limit of 4 isocenters can be used
- Changing the density of any structure is not allowed
- Several metrics were described as CRITICAL, meaning if the minimum requirement for that metric was not met (i.e., lowest objective) then your total plan score would be set to zero
- As always, make sure your plans are practical, realistic, and something you would plan for a real patient in your clinic

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PLAN CHALLENGE METRICS

#	METRIC ID (35 Total Metrics)	WEIGHT (150)	PERFORMANCE BINS				
[01]	Volume (%) of the PTV3000 covered by 30 (Gy)	10	> 90 UNACCEPTABLE	90 MARGINAL	95 ACCEPTABLE	97.5 GOOD	100 IDEAL
[02]	Volume (%) of the CTV3000 covered by 30 (Gy)	10	> 90 UNACCEPTABLE	90 MARGINAL	95 ACCEPTABLE	97.5 GOOD	100 IDEAL
[03]	Dose (Gy) covering whole CTV3000 minus 0.03 (cc)	10	> 24 UNACCEPTABLE	24 MARGINAL	26 ACCEPTABLE	28 GOOD	30 IDEAL
[04]	Conformation Number [30 (Gy), PTV3000]	10	> 0.4 UNACCEPTABLE	0.4 MARGINAL	0.6 ACCEPTABLE	0.8 GOOD	1 IDEAL
[05]	Volume (%) of the PTV2000 covered by 20 (Gy)	10	> 90 UNACCEPTABLE	90 MARGINAL	95 ACCEPTABLE	97.5 GOOD	100 IDEAL
[06]	Volume (%) of the CTV2000 covered by 20 (Gy)	10	> 90 UNACCEPTABLE	90 MARGINAL	95 ACCEPTABLE	97.5 GOOD	100 IDEAL
[07]	Dose (Gy) covering whole CTV2000 minus 0.03 (cc)	10	> 17 UNACCEPTABLE	17 MARGINAL	18 ACCEPTABLE	19 GOOD	20 IDEAL
[08]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the brain_stem	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL
[09]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the cord	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL
[10]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the optic_chiasm	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL
[11]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the optic_nrv_l	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL
[12]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the optic_nrv_r	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL
[13]	Dose (Gy) covering 0.03 (cc) of the Eye_L	3	> 28 UNACCEPTABLE	28 MARGINAL	26 ACCEPTABLE	24 GOOD	22 IDEAL
[14]	Dose (Gy) covering 0.03 (cc) of the Eye_R	3	> 28 UNACCEPTABLE	28 MARGINAL	26 ACCEPTABLE	24 GOOD	22 IDEAL
[15]	Mean dose (Gy) to the Eye_L	3	> 22.5 UNACCEPTABLE	22.5 MARGINAL	20 ACCEPTABLE	17.5 GOOD	15 IDEAL
[16]	Mean dose (Gy) to the Eye_R	3	> 22.5 UNACCEPTABLE	22.5 MARGINAL	20 ACCEPTABLE	17.5 GOOD	15 IDEAL
[17]	Maximum dose (Gy) to the Lens_L	3	> 21 UNACCEPTABLE	21 MARGINAL	18 ACCEPTABLE	15 GOOD	12 IDEAL
[18]	Maximum dose (Gy) to the Lens_R	3	> 21 UNACCEPTABLE	21 MARGINAL	18 ACCEPTABLE	15 GOOD	12 IDEAL
[19]	Mean dose (Gy) to the retina_l	3	> 21 UNACCEPTABLE	21 MARGINAL	18 ACCEPTABLE	15 GOOD	12 IDEAL
[20]	Mean dose (Gy) to the retina_r	3	> 21 UNACCEPTABLE	21 MARGINAL	18 ACCEPTABLE	15 GOOD	12 IDEAL

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PLAN CHALLENGE METRICS

#	METRIC ID (35 Total Metrics)	WEIGHT (150)	PERFORMANCE BINS					
[21]	Mean dose (Gy) to the lacrimal_l	3	> 22 UNACCEPTABLE	22 MARGINAL	18 ACCEPTABLE	14 GOOD	10 IDEAL	
[22]	Mean dose (Gy) to the lacrimal_r	3	> 22 UNACCEPTABLE	22 MARGINAL	18 ACCEPTABLE	14 GOOD	10 IDEAL	
[23]	Mean dose (Gy) to the Parotid_L	3	> 12 UNACCEPTABLE	12 MARGINAL	10 ACCEPTABLE	8 GOOD	6 IDEAL	
[24]	Mean dose (Gy) to the Parotid_R	3	> 12 UNACCEPTABLE	12 MARGINAL	10 ACCEPTABLE	8 GOOD	6 IDEAL	
[25]	Dose (Gy) covering 0.03 (cc) of the thyroid	3	> 25 UNACCEPTABLE	25 MARGINAL	20 ACCEPTABLE	15 GOOD	10 IDEAL	
[26]	Dose (Gy) covering 0.03 (cc) of the esophagus	3	> 29 UNACCEPTABLE	29 MARGINAL	26 ACCEPTABLE	23 GOOD	20 IDEAL	
[27]	Mean dose (Gy) to the lung_total	3	> 8 UNACCEPTABLE	8 MARGINAL	6 ACCEPTABLE	4 GOOD	2 IDEAL	
[28]	Mean dose (Gy) to the kidney_total	3	> 12 UNACCEPTABLE	12 MARGINAL	10 ACCEPTABLE	8 GOOD	6 IDEAL	
[29]	Mean dose (Gy) to the heart	3	> 12 UNACCEPTABLE	12 MARGINAL	10 ACCEPTABLE	8 GOOD	6 IDEAL	
[30]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the External	3	> 34.5 UNACCEPTABLE	34.5 MARGINAL	33.5 ACCEPTABLE	32.5 GOOD	31.5 IDEAL	
[31]	[CRITICAL] Maximum dose (Gy) to the zcord prior	3	> 32 FAIL				32 PASS	
[32]	[CRITICAL] Maximum dose (Gy) to the prev30Gy	3	> 23 FAIL				23 PASS	
[33]	[CRITICAL] Number of unique couch angles	0	> 1 FAIL				1 PASS	
[34]	[CRITICAL] Number of unique isocenters	0	> 4 FAIL				4 PASS	
[35]	Cumulative meterset over all treatment beams	---	Unscored metric and/or performance bins are not defined.					

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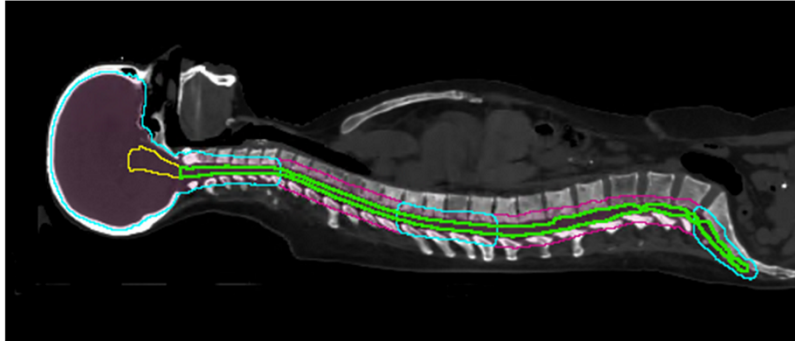
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PLAN CHALLENGE

DIFFICULT METRICS

Noted from results

[08]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the brain_stem	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL
[09]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the cord	4	> 33.5 UNACCEPTABLE	33.5 MARGINAL	32.5 ACCEPTABLE	31.5 GOOD	30.5 IDEAL



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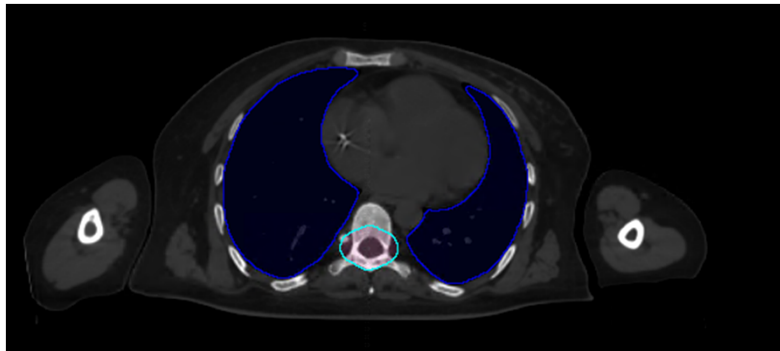
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PLAN CHALLENGE

DIFFICULT METRICS

Noted from results

[27]	Mean dose (Gy) to the lung_total	3	> 0 UNACCEPTABLE	0 MARGINAL	6 ACCEPTABLE	4 GOOD	2 IDEAL
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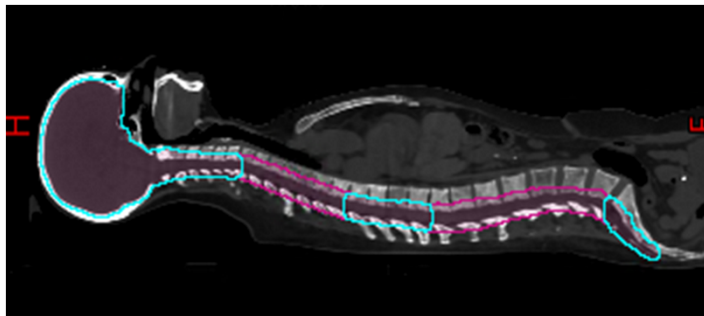
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PLAN CHALLENGE

DIFFICULT METRICS

Noted from results

[01]	Volume (%) of the PTV3000 covered by 30 (Gy)	10	< 90 UNACCEPTABLE	90 MARGINAL	95 ACCEPTABLE	97.5 GOOD	100 IDEAL
[30]	[CRITICAL] Dose (Gy) covering 0.03 (cc) of the External	3	> 34.5 UNACCEPTABLE	34.5 MARGINAL	33.5 ACCEPTABLE	32.5 GOOD	31.5 IDEAL



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PLAN CHALLENGE

DIFFICULT METRICS

Noted from participants

- Target coverage
- Plan conformity
- Combination of above along with max dose constraints to OAR
 - Optics, brainstem, cord
- Photon users commented on the lung_total mean dose as being one of the most challenging to push for and maintain coverage goals
- Several commented on the overall complexity contributing to long optimization and calculation times- adding another layer of difficulty

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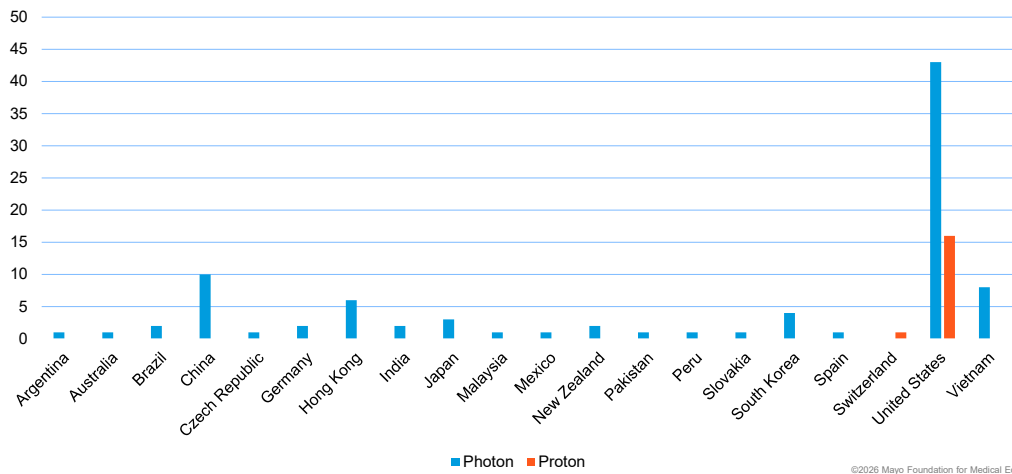
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3 RESULTS

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RESULTS PARTICIPATION BY COUNTRY

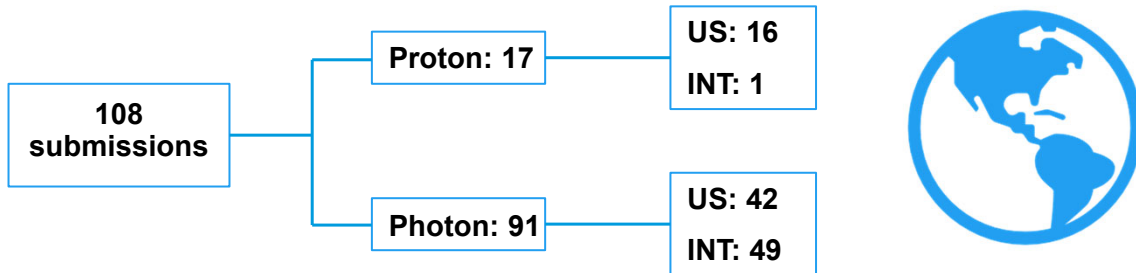


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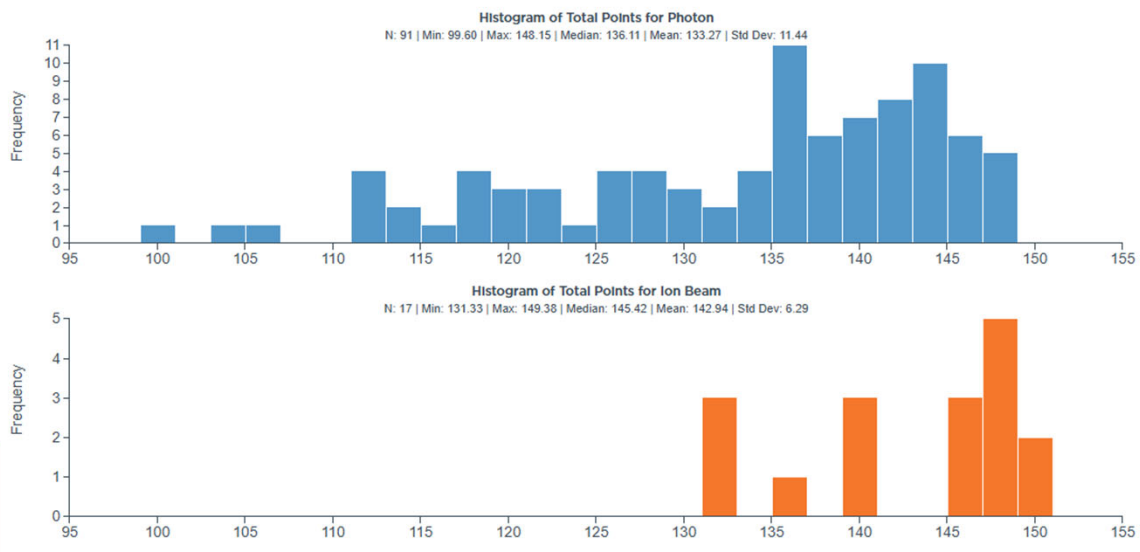
RESULTS

TOTAL PARTICIPATION



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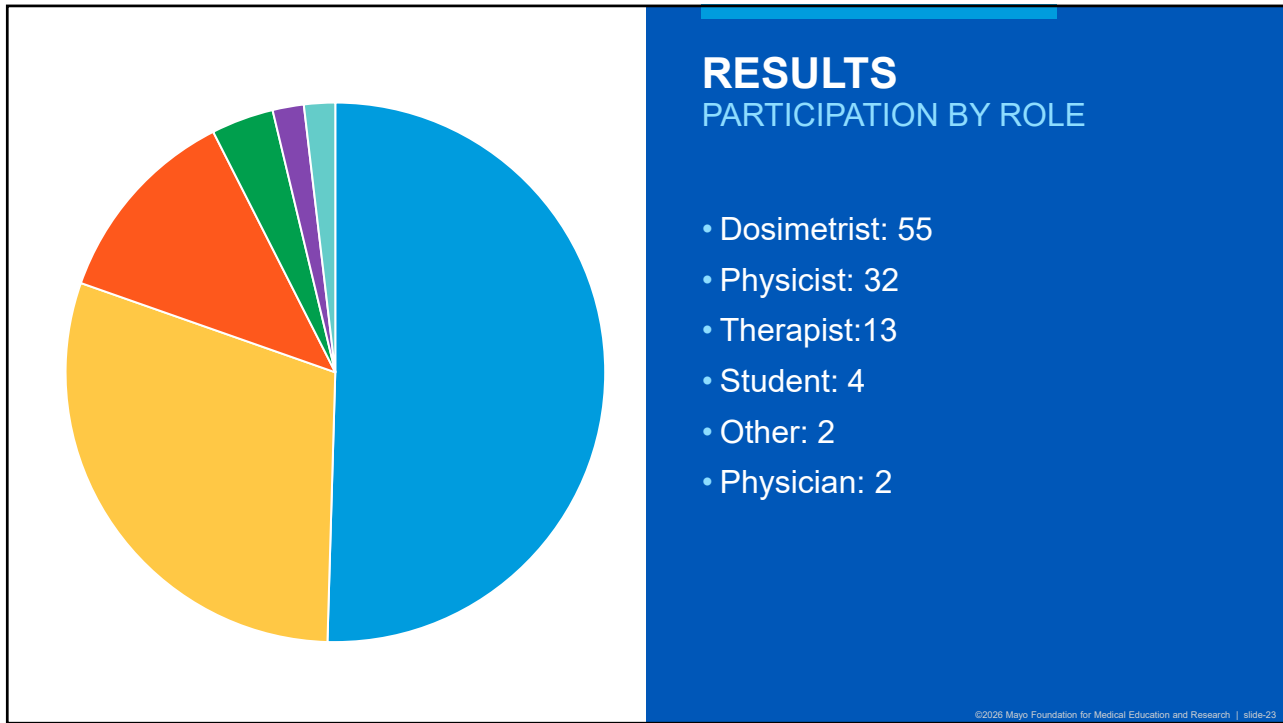


RESULTS

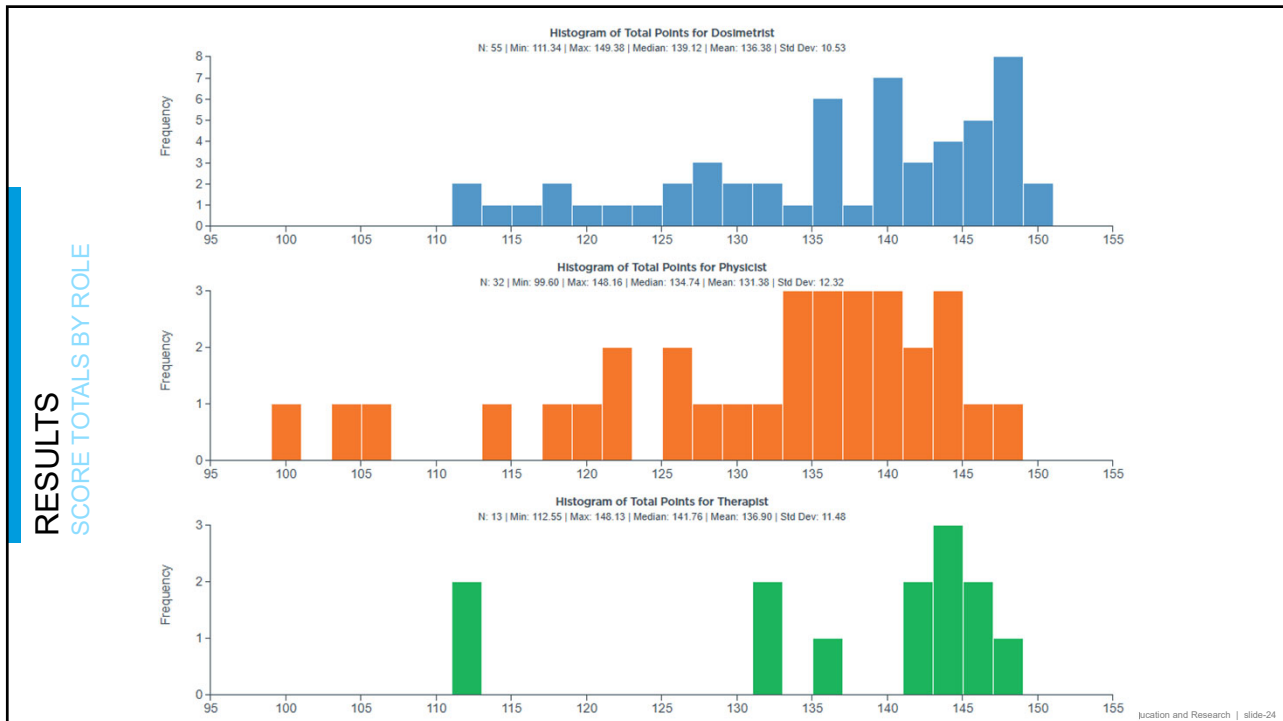
SCORE TOTALS BY RADIATION TYPE

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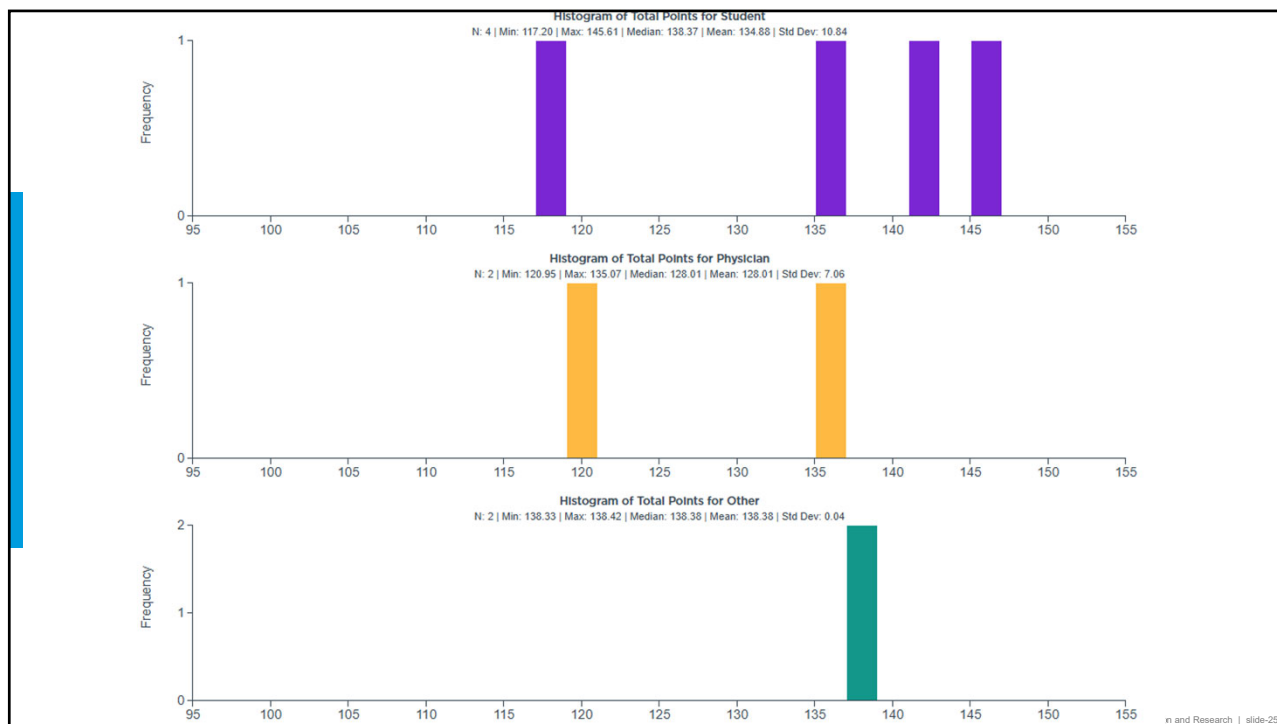
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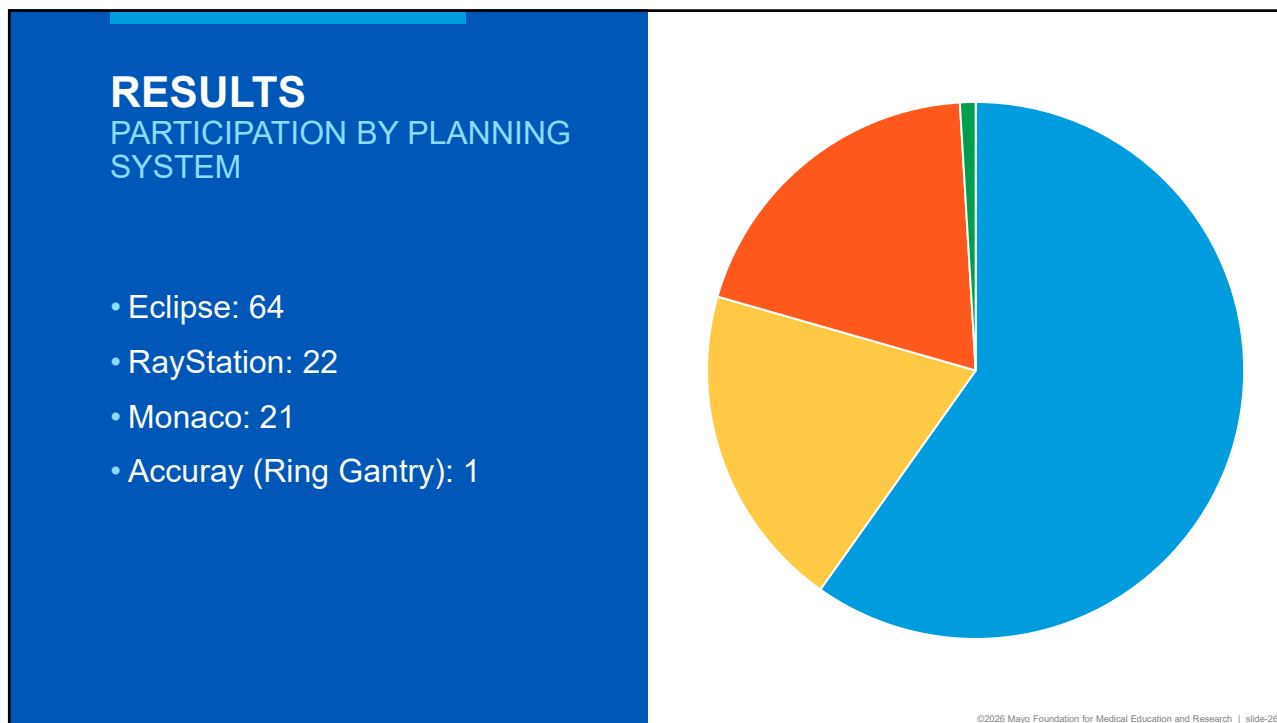
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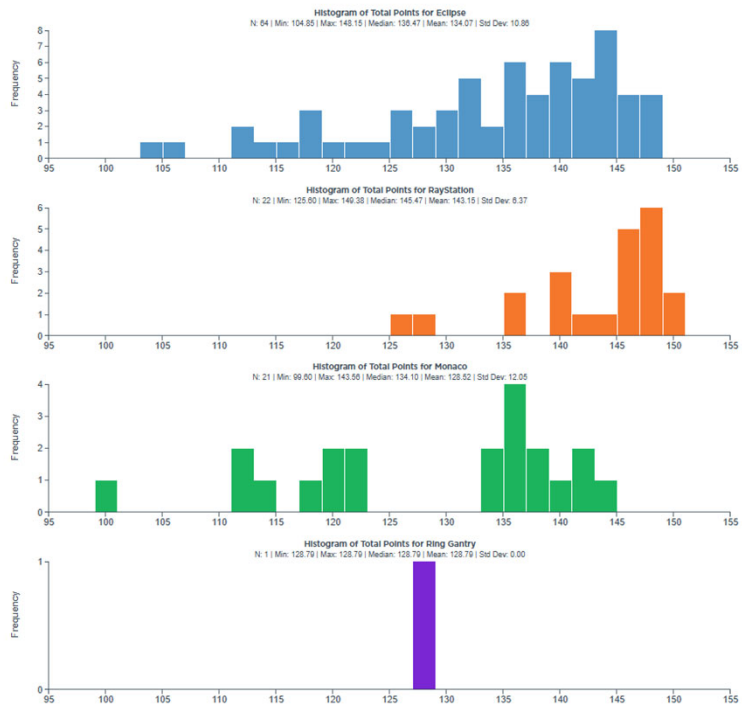


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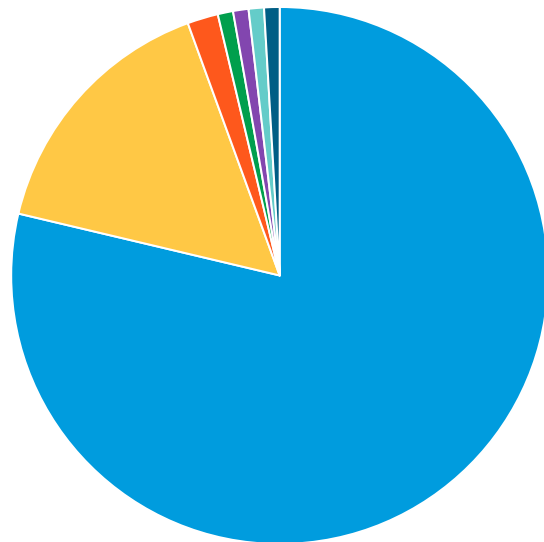
RESULTS
SCORE TOTALS BY PLANNING SYSTEM



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RESULTS
PARTICIPATION BY DELIVERY TYPE

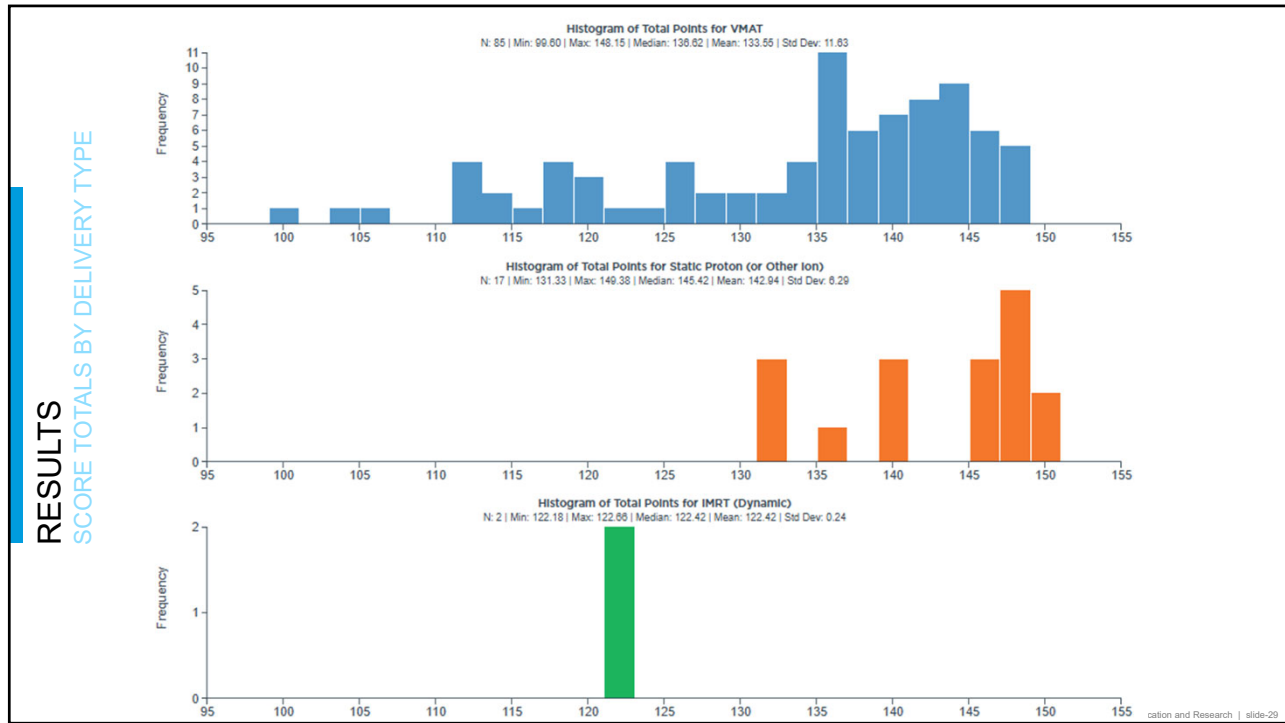
- VMAT: 85
- Static Proton: 17
- IMRT (Dynamic): 2
- Photon Arc: 1
- Helical Arc: 1
- IMRT (Dynamic) + VMAT: 1
- Photon Arc + Static Photon: 1



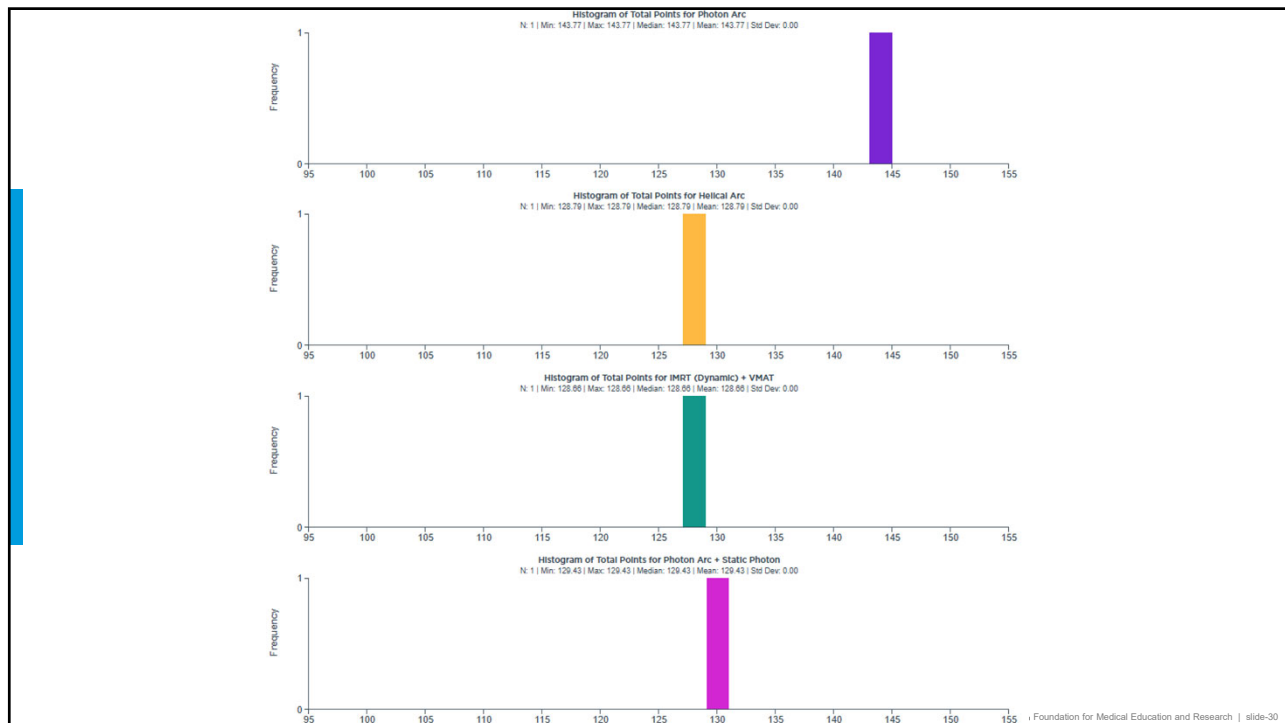
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RESULTS
SCORE TOTALS BY DELIVERY TYPE



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TOP PERFORMERS

Proton

- Fazal Khan
 - US
- Tyler Williamson
 - Switzerland
- Shae Gans
 - US
- Stephen Zieminski
 - US
- Lee Xu- physicist
 - US

*All used RayStation

Photon

- Tsao Gary Ka Yu
 - Hong Kong
 - Eclipse
- Alex Li- therapist
 - Hong Kong
 - Eclipse
- Paul Cooper
 - US
 - Eclipse
- Amanuel Negussie
 - US
 - RayStation
- Kory Byrnes
 - US
 - Eclipse

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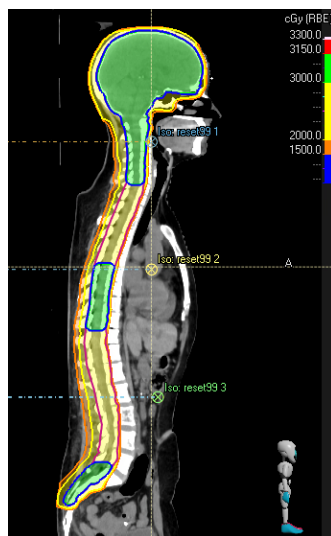
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RESULTS

PROTON VS PHOTON COMPARISON

Proton

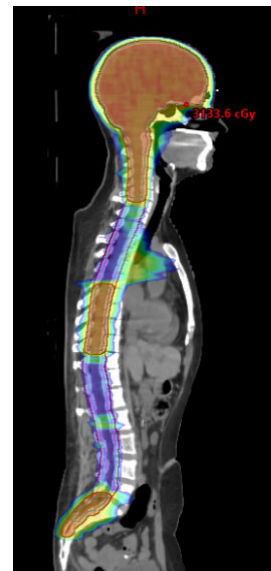
- Better conformality
- Lower 0.03 cc dose to cord
- Lower mean dose to the lung_total



Isodose lines for proton plan (RayStation)

Photon

- Better PTV coverage



Isodose color wash at 20 Gy (Eclipse)

32

4

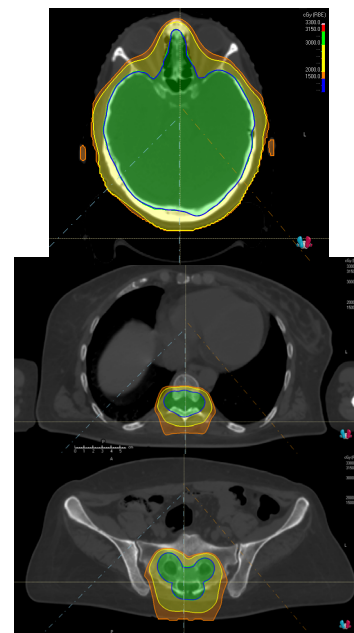
PLANNING TIPS AND TRICKS

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PLANNING TIPS AND TRICKS PROTON (RAYSTATION)

- Fazal Khan
 - SOP in progress
 - Generally, use minimal number of isocenters, allowing for 7-10 cm overlap
 - Use range shifters as appropriate
 - Single PA or two posterior obliques per isocenter
 - Varied for plan challenge to use both PA and posterior obliques. Also decreased dose grid resolution to increase plan quality which increased opt/calc time. Decreased the dose grid dimensions to counter that somewhat
 - Not typical for most clinical cases
 - **Tips/Tricks**
 - Use fastest/most powerful servers with most system and GPU memory
 - In Raystation- constraints seem attractive but use with caution
 - Planners need to fully understand function values and total objective value in Raystation



Isodose distribution: 15 Gy orange, 20 Gy yellow, 30 Gy green

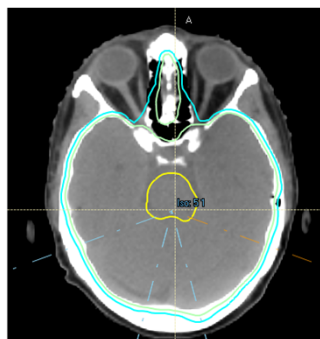
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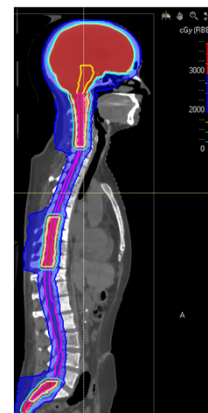
PLANNING TIPS AND TRICKS PROTON (RAYSTATION)

• Tyler Williamson

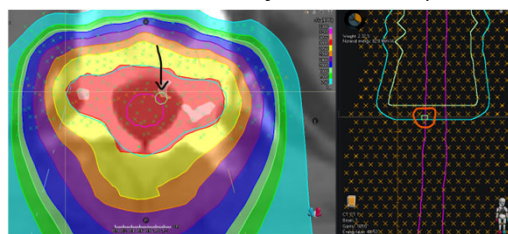
- Unique planning approach due to the in house gantry utilized (not applicable to many proton centers)
- SOP
 - Standard CSI: 4 total fields (LPO/RPO) 2 fields x 2 due to automatic range shifter
 - Retreat CSI: 8+ total fields (added LPO/RPO for the brain)
 - Can use additional range shifter
- Utilized SOP for this challenge
- **Tips/Tricks**
 - Rings for conformality
 - Spot editing for hot/cold spots
- Note: dose grid max dimension and dose grid voxel volume were decreased to 2mm per the SOP. This did impact optimization time slightly



Standard beam arrangement



20 and 30 Gy isodose distribution



Spot editing

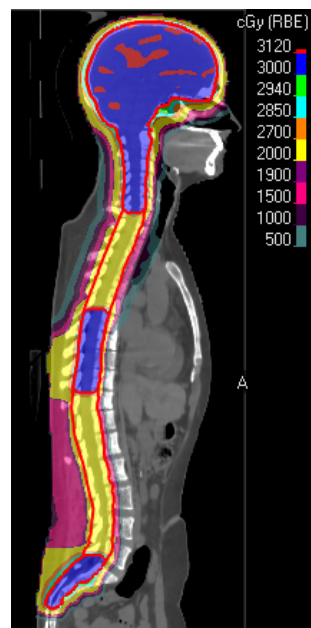
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PLANNING TIPS AND TRICKS PROTON (RAYSTATION)

• Shae Gans

- SOP
 - Detailed script that can generate an optimized plan to build from
 - Will use minimum number of fields
 - Built in feathering
 - Adjusts robustness settings, planning objectives, field match lines, and beam parameter settings based off desired prescription
 - Depending on length of target, 2-3 PA fields
- Varied from SOP due to multiple dose levels. Required additional brain fields to gain better conformality and reduce OAR dose
- **Tips/Tricks**
 - Dose fall off objective and custom rings
 - Multiple rings for conformality between the high/low dose levels
 - Utilizing clinical goals within the TPS to immediately see changes that could impact the score without having to upload to ProKnow each time



Isodose distribution

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PLANNING TIPS AND TRICKS PROTON (RAYSTATION)

- Stephen Zieminski
 - SOP being updated due to software and hardware upgrades
 - Unfortunately, limitation of couch angles resulted in plan that is not typical
 - Wider cranial gantry spread would help with conformity in nasal cavity
 - **Tips/Tricks**
 - Leverage scripts to help build plan quicker
 - Played with energy layer/spot spacing for each beam



Isodose distribution

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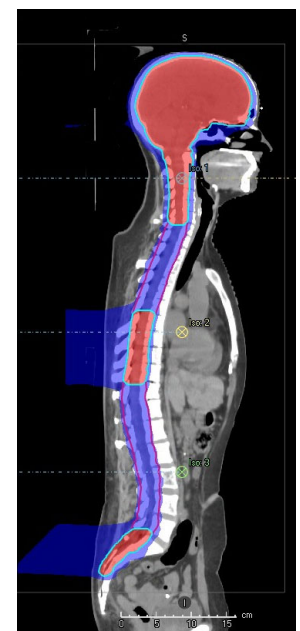
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PLANNING TIPS AND TRICKS PROTON (RAYSTATION)

- Lee Xu
 - SOP
 - Fully standardized and auto planned with a script
 - 2-4 isocenters depending on length of CTV
 - Isocenter placed using algorithm that ensures that vertebral bodies are fully visualized in the FOV (lower sacrum and top of skull may be out of view)
 - Dose feathered gradually over a 10 cm junction between fields
 - One single posterior field per isocenter
 - Prior brain treatment would switch to 3 fields
 - Varied from SOP. Utilized additional brain fields to gain better conformity and reduce OAR dose (2 ant obliques plus posterior). Decreased energy layer and spot spacing
 - **Tips/Tricks**
 - Rings for conformity
 - Multiple optimizations and finessing spot map
 - Slowly push on OAR to avoid under coverage



Isodose distribution with three brain fields



20 Gy isodose distribution

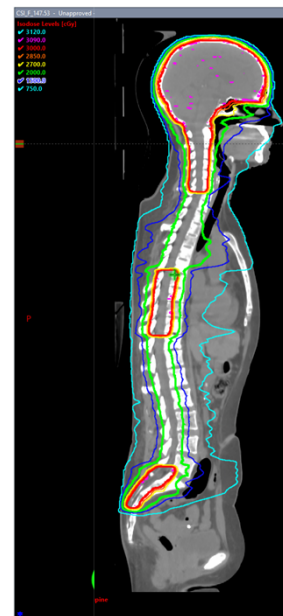
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PLANNING TIPS AND TRICKS PHOTON (ECLIPSE)

• Paul Cooper

- Do not currently treat CSI, so no SOP
 - Never done a CSI before
 - Last observed utilized a 3D approach
- Although no SOP, did deviate from what would be done clinically
 - Did not use avoidance structure through arms, would have probably for a clinical case
 - Utilized 4 isocenters with 4 ARCs each, would likely decrease that to minimize treatment time for a real patient
- **Tips/Tricks**
 - Study scoring metrics to determine which criteria are worth pursuing most in a challenge like this
 - If running into issues, adjust isocenters and other beam parameters
 - Strategic overlapping of ARCs in regions where more modulation is helpful
 - Change convergence mode to “Extended”
 - During optimization, pause and allow cost functions to flatten out at each MR level



Isodose distribution

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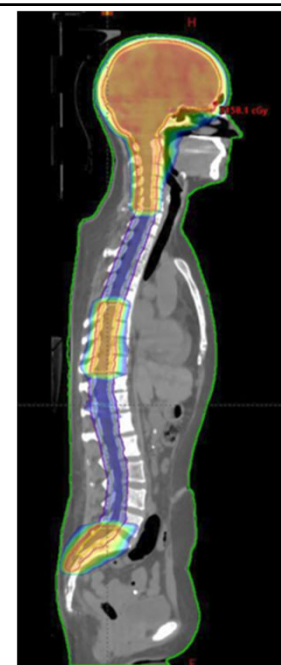
PLANNING TIPS AND TRICKS PHOTON (ECLIPSE)

• Kory Byrnes

- No SOP
- Maximized isocenters and ARCs available for planning
- **Tips/Tricks**
 - Place isocenters to best utilize the smallest MLC over the 30 Gy volume
 - For brain isocenter, placing just above the eyes allowed for the 90 degree collimators to better spare optics overall
 - Optimization time was key, added use of extended convergence mode to level off at low dose
 - GPU allowed for faster optimization time which gave opportunities to test various isocenter placements and optimization strategies- leading to overall score improvement



Isocenter placement



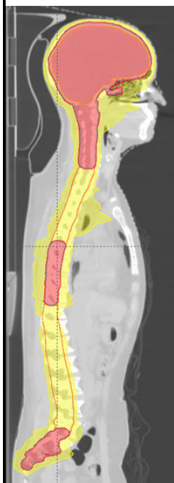
20Gy isodose distribution

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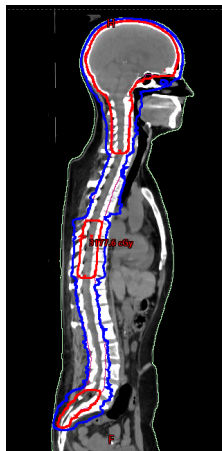
PLANNING TIPS AND TRICKS PHOTON (ECLIPSE)

• Justin Macal



20Gy isodose distribution

- No SOP
 - For actual clinical plan would limit isocenters to 3 and 2 ARCs per isocenter
- **Tips/Tricks**
 - Increase isocenters to improve conformity
 - Restart in MR4 to make nuanced adjustments



20Gy isodose distribution

• Jason Alberth

- Recently graduated, so no SOP
- For actual clinical plan, would try to limit isocenters/fields for reduced treatment time on table
- **Tips/Tricks**
 - Eclipse optimization works better with smaller structures, broke up PTVs into chunks



20Gy isodose distribution

• Wesley Groves

- No SOP
 - Not frequently planned, maybe one in last 20 years and it was 3D
- **Tips/Tricks**
 - Varian IX does not have jaw tracking, limit jaws to 15 cm to avoid leaf travel issues

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PLANNING TIPS AND TRICKS PHOTON (RAYSTATION)

• Amanuel Negussie

- SOP
 - Standard approach to use 3 isocenters: base of skull, mid lung, mid abdomen
 - Two full ARCs per isocenter with 5 degree collimator
 - 6 MV for brain iso and 10 MV for spine
 - Robust optimization utilized at junctions to account for setup and range uncertainties
- Varied for plan challenge to use 4 isocenters, an additional ARC with 90 collimator per isocenter to improve conformity, and 10 MV for all fields to better control hot spots
- **Tips/Tricks**
 - Break target into smaller subregions to optimize with them individually
 - Allowed for increase dose shaping and OAR sparing



20Gy isodose distribution

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PLANNING TIPS AND TRICKS

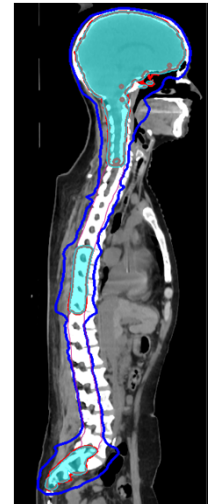
PHOTON (RAYSTATION)

• James Kim

- No SOP
 - Actual clinical plan would reduce/limit number of isocenters/fields
- For this plan challenge, used max number to push the score
 - Also sent some info for a more clinically appropriate plan
- **Tips/Tricks**
 - Two rules: "Simple is best" and "Small is better"
 - Avoid throwing in too many constraints right away
 - Break up targets to provide tighter, localized control
 - Used 4 ARCs per isocenter but restricted jaw settings on 2 of them to better carve nearby OARs
 - In Eclipse would have tried a VMAT/static IMRT approach- RayStation dose not have this option



20Gy isodose distribution, challenge plan



20Gy isodose distribution, clinical plan

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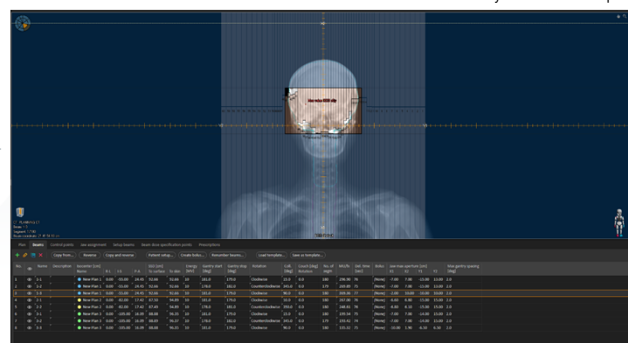
PLANNING TIPS AND TRICKS

PHOTON (RAYSTATION)

• James Kim

- Original, 16 beams, 145.52 score

Study Name: 2026 AAMD Plan Study: Craniospinal with Prior XRT
 Participant Name: Jung Joon "James" Kim
 Participant Email: JamesKimPhysics@gmail.com
 Participant Role: physicist
 Participant Institution: Wellstar Health
 Created: Thu May 14 2026 19:42:17 GMT+0000
 TPS Manufacturer: RaySearch Laboratories
 TPS Model: RayStation
 Number of Treatment Beams: 8
 Radiation Type(s): Photon
 Delivery Type(s): VMAT



RayStation field example

143.25	150.00
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Plan information

BEAM [#] NAME	MACHINE	MODALITY	ENERGY		
[01] 1-1	KCA_TB_p6e	VMAT (180 CPs)	10 MV	296.9001 MU	66
[02] 1-2	KCA_TB_p6e	VMAT (179 CPs)	10 MV	269.8941 MU	64
[03] 1-3	KCA_TB_p6e	VMAT (180 CPs)	10 MV	369.3638 MU	71
[04] 2-1	KCA_TB_p6e	VMAT (180 CPs)	10 MV	267.0042 MU	67
[05] 2-2	KCA_TB_p6e	VMAT (180 CPs)	10 MV	248.6135 MU	66
[06] 3-1	KCA_TB_p6e	VMAT (180 CPs)	10 MV	199.5424 MU	61
[07] 3-2	KCA_TB_p6e	VMAT (179 CPs)	10 MV	193.4246 MU	60
[08] 3-3	KCA_TB_p6e	VMAT (180 CPs)	10 MV	135.3376 MU	60
				1980.06 (TOTAL)	8.58 min (TOTAL)

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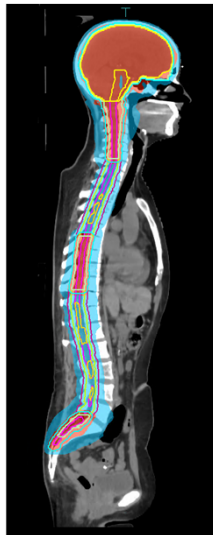
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PLANNING TIPS AND TRICKS

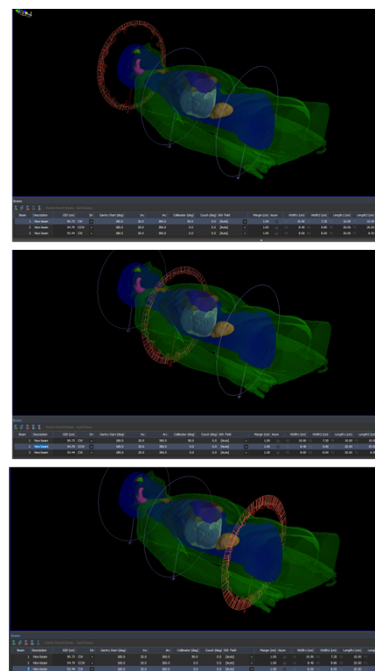
OTHER PLANNING SYSTEMS (MONACO)

- Brett Sloman

- No SOP
 - Doesn't work in a clinic so just used a technique common for Monaco users
- **Tips/Tricks**
 - Cost functions built using Plan Generation Application
 - Game of give and take after built to balance various constraints
 - Maintain collimator for each isocenter and allow system to split the fluence to reduce dose to midline structures and low for more modulation without excessive rotations



20Gy isodose distribution, clinical plan



Monaco setup

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PLANNING TIPS AND TRICKS

OTHER PLANNING SYSTEMS (TOMOTHERAPY)

- Michelle Motto

- No SOP
 - Clinic does not treat CSI
 - Older machine which makes treating with more than 2 isocenters difficult so switched to a single isocenter tomotherapy plan
 - **Tips/Tricks**
 - Use RayStation "fine tune" while planning
- Score: 143.77



Isodose distribution

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PLANNING TIPS AND TRICKS

THEMES

- Proton
 - CSI planning is increasingly automated and script-driven.
 - Most planners deviated from clinical SOPs to meet challenge scoring metrics
 - Additional isocenters/fields
 - Cranial conformity—not spinal coverage—was the major difficulty
 - Added beam angles
 - The central challenge was balancing coverage, conformity, and OAR sparing.
 - Iterative optimization and spot-map refinement mattered more than beam angle selection alone.
 - Common successful techniques included rings, dose falloff objectives, spot editing, and fine-tuned optimization settings.
 - Computational limitations were a significant factor
 - Long optimization times
- Photon
 - Challenge plans often differed from clinical practice
 - Additional isocenters/fields
 - Lung mean dose was the primary challenge
 - Difficult to maintain target coverage and reduce mean lung dose
 - Isocenter placement and field geometry were critical
 - Increased modulation improved performance
 - Added isocenters/fields, mixed energies, varying collimators provided greater optimizer flexibility
 - Localized optimization strategies were effective
 - Break target into smaller regions
 - TPS Expertise influenced success
 - Across planning systems, understanding optimizer behavior and TPS specific tools
 - Optimization and computational demands were significant
 - Long optimization times, memory limitations

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THANK YOU!

- Elekta and ProKnow Systems Application Specialist:
Rick Scherer (Rick.Scherer@elekta.com)
- AAMD
- Top performers and all those that responded with their feedback, tips/tricks, and screenshots
- All who participated

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QUESTIONS



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