University of Michigan
Department of Radiation Oncology
Division of Radiation Physics

Brachytherapy Rotation I & II

Resident: _____

Rotation staff mentor/ advisor(s): _Choonik Lee and Joann Prisciandaro, Zheng Zhang, Charlie Matrosic, Alex Moncion

_____

Rotation Duration: 2 months each rotation

Rotation Dates: _____

A medical physics resident in radiation oncology at the University of Michigan will be expected to demonstrate the following competencies associated with brachytherapy and radiation safety. Listed below are the minimum standards.

Contents Outline

Knowledge Factors – List of reading assignment

1. Title 10 of the federal code of regulations (parts 19, 20, & 35) http://www.nrc.gov/reading-rm/doc-collections/cfr/
2. State Regulations (MI-LARA) - https://www.michigan.gov/leo/0,5863,7-336-78421_11407_35791---,00.html https://www.michigan.gov/leo/0,5863,7-336-94422_11407_35791-385258--,00.html
3. AAPM Task Group #43U, "Dosimetry of Interstitial brachytherapy sources."
4. AAPM Task Group #56, "Code of practice for brachytherapy physics."
5. AAPM Task Group #59, "HDR brachytherapy treatment delivery."
6. AAPM Task Group #129, "Dosimetry of I-125 and Pd-103 COMS eye plaques for intraocular tumors."
7. AAPM Task Group #221, "AAPM recommendations on medical physics practices for ocular plaque brachytherapy"
8. AAPM Report 98, "Third-party brachytherapy source calibrations and physicist responsibilities."
9. AAPM Task Group 138, "A dosimetric uncertainty analysis for photon-emitting brachytherapy sources."
10. AAPM Task Group 144, "Recommendations of the AAPM on dosimetry, imaging, and quality assurance procedures for Y-90 microsphere brachytherapy in the treatment of hepatic malignancies."
11. AAPM Task Group 186, "Model-based dose calculation methods in brachytherapy beyond the TG-43 formalism."
12. NCRP Report No. 155, "Management of Radionuclide Therapy Patients." – Chapter 6.

13. C. Haie-Meder *et al*., "Recommendations from Gynaecological (GYN) GEC-ESTRO Working Group (I): concepts and terms in 3D image based 3D treatment planning in cervix cancer brachytherapy with emphasis on MRI assessment of GTV and CTV," Radiotherapy and Oncology, 74, 235-45 (2005).
14. R. Potter *et al.*, "Recommendations form gynaecological (GYN) GEC ESTRO working group (II): Concepts and terms in 3D image-based treatment planning in cervix cancer brachytherapy – 3D dose volume parameters and aspects of 3D image-based anatomy, radiation physics, radiobiology," Radiotherapy and Oncology,78, 67-77 (2006).
15. T.P. Hellebust *et al.*, "Recommendations form Gynaecological (GYN) GEC-ESTRO Working Group: Considerations and pitfalls in commissioning and applicator reconstruction in 3D image-based treatment planning of cervix cancer brachytherapy," Radiotherapy and Oncology, 96, 153-60 (2010).
16. Dimopoulos *et al.*, "Recommendations from GYN GEC-ESTRO Working Group (IV): Basic principles and parameters for MR imaging within the frame of image based adaptive cervix cancer brachytherapy," Radiotherapy and Oncology, 103, 113-22 (2012).
17. EMBRACE II protocol, https://www.embracestudy.dk/UserUpload/PublicDocuments/EMBRACE%20II%20Protocol.pdf.
18. Tanderup *et al.,* "Applicator reconstruction in cervix brachytherapy," EMBRACE Appendix, https://www.embracestudy.dk/UserUpload/PublicDocuments/Applicator%20reconstruction%20catalogue.PDF.
19. AAPM Clinical Brachytherapy Physics, AAPM Monogram No. 38 (2017 AAPM Summer School) – Chapters 4, 5, 6, 8 (Physical book in resident library)
20. AAPM Summer School 2005 "Episcleral Eye Plaques For Treatment Of Intra-Ocular Malignancies And Benign Diseases" by Chiu-Tsao

Knowledge Factors – List of reading assignment (OPTIONAL)

1. AAPM Task Group #137, "AAPM recommendations on dose prescription and reporting methods for permanent interstitial brachytherapy for prostate cancer." - Executive Summary
2. AAPM Report No. 149, "Dose calculation formalisms and consensus dosimetry parameters for intravascular brachytherapy dosimetry," 2007.
3. AAPM Task Group 221, "AAPM recommendations on medical physics practices for ocular plaque brachytherapy"
4. AAPM Task Group 303." MRI implementation in HDR brachytherapy—Considerations from simulation to treatment"
5. ICRU Report 89, "*Prescribing, recording, and reporting brachytherapy for cancer of the cervix"*
6. NUREG-1556 (https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1556/index.html)
7. ABS consensus statements (https://www.americanbrachytherapy.org/consensus-statements/):
    a. GYN
        i. Cervix cancer (part 1 and 2)
        ii. Adjuvant vaginal cuff
        iii. Inoperable endometrial cancer
        iv. Interstitital for vaginal cancer

b. Eye
c. Prostate
    i. Transrectal US guided permanent implants
    ii. HDR
d. Breast

8. IROC Houston source registry: http://rpc.mdanderson.org/RPC/home.htm
9. Goetsch *et al.*, "Calibration of Ir-192 high-dose-rate afterloading systems," Med Phys, 18(3), 462-67 (1991).
10. Seltzer *et al.*, "New national air-kerma strength standards for I-125 and Pd-103 brachytherapy seeds," J Res Natl Inst Stand Technol, 108, 337-58 (2003).

Knowledge Factors – Regulations (Rotation I, JIP)

MUST BE COMPLETED WITHIN FIRST 2 WEEKS OF ROTATION I

Read and demonstrate an understanding of 10CFR19.

Signature / Date	

Read and demonstrate an understanding of 10CFR20.

Signature / Date	

Read and demonstrate an understanding of 10CFR35.

Signature / Date	

Read and demonstrate an understanding the Michigan State regulations.

Signature / Date	

Knowledge Factors – General Brachytherapy (Rotation I)

Review and discuss the IROC Houston source registry. (CIL)

Signature / Date	

Read and demonstrate an understanding of AAPM TG-43U report, including different source strength units used for brachytherapy. (CIL)

Signature / Date	

Perform TG-43 calculations for a single, double, and triple source plan. (CIL)

Signature / Date	
Signature / Date	
Signature / Date	

Read and demonstrate an understanding of AAPM TG-56 report, in particular, how brachytherapy programs are developed. (JIP)

Signature / Date	

Read and demonstrate an understanding of AAPM TG-59 report. Discuss commissioning and acceptance of remote afterloaders. (JIP)

Signature / Date	

Discuss decay, decay energies (mean energy), and half-lives of brachytherapy sources (e.g., Ra-226, Cs-137, Ir-192, Y-90, Pd-103, Cs-131, and I-125). (JIP)

Signature / Date	

Discuss the advantages and disadvantages of LDR, HDR, and PDR brachytherapy. (JIP)

Signature / Date	

Knowledge Factors – HDR Brachytherapy (Rotation I)

Demonstrates an understanding of GYN (cervical), anatomy, staging, and treatment. (Read ABS Cervical Cancer Gudelines I and II)

Signature / Date	

Demonstrates an understanding of GYN (endometrial), anatomy, staging, and treatment. (Read ABS Vaginal Cuff Guidelines)

Signature / Date	

Review and discuss the ABS guidelines, consensus statements, and task group reports for GYN cancers.

Signature / Date	

Knowledge Factors – Eye plaque (Rotation I)

Read and discuss COMS protocol. (CKM)

Signature / Date	

Read and demonstrate an understanding of AAPM TG-129 report. (CKM)

Signature / Date	

Knowledge Factors – Handling Radioactive Sources (Rotation II)

Read and demonstrate an understanding of AAPM Report 98. (CIL)

Signature / Date	

Knowledge Factors – General Brachytherapy (Rotation II)

Read and demonstrate an understanding of AAPM TG-186 report. (ZZ)

Signature / Date	

Demonstrates an understanding of breast anatomy, staging, and treatment. (AM)

Signature / Date	

Demonstrates an understanding of prostate (GU) anatomy, staging, and treatment. (CIL)

Signature / Date	

Review and discuss the ABS consensus statements on breast cancer. (AM)

Signature / Date	

Review and discuss the ABS guidelines, consensus statements, and task group reports for prostate cancers. (CIL)

Signature / Date	

Read and discuss the AAPM TG-64 report (Prostate LDR). (CIL)

Signature / Date	

Read and discuss the AAPM TG-137 report (Prostate LDR). (CIL)

Signature / Date	

Knowledge Factors – HDR Brachytherapy (Rotation II, JIP)

Read and demonstrate an understanding of the GEC-ESTRO recommendations for volume based treatment planning for cervical cancer.

Signature / Date	

Read and demonstrate an understanding of the GEC-ESTRO recommendations for volume based treatment planning for cervical cancer.

Signature / Date	

Knowledge Factors – Others (Rotation II)

Read and discuss the AAPM TG-144 report (microspheres). (ZZ)

Signature / Date	

Practical Factors – Handling Radioactive Sources (Orientation and Rotation I)

Perform hot lab survey and quarterly inventory. Discuss leak checks of sealed sources. (JIP)

Signature / Date	

Complete and demonstrate an understanding of radioactive material packaging and transportation lecture. (JIP)

Signature / Date	

Practical Factors – HDR (Rotation I)

Observe morning QA.

Signature / Date	

Perform morning QA independently.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Participate in source exchange QA.

Signature / Date	

Perform monthly QA.

Signature / Date	

Perform patient survey before and after the HDR treatment.

Signature / Date	
Signature / Date	
Signature / Date	

Participate/discuss 2nd check of treatment plans.

Date	Applicator Type	Supervisor *Signature*

Generate test and/or clinical GYN treatment plans (cylinder, R&T, Miami, etc.).

	Applicator Type	Reviewed by:
1		
2		
3		
4		
5		

Practical Factors – LDR Eye Plaque (Rotation I)

Observe and discuss eye plaque procedure.

Signature / Date	

Generate an eye plaque treatment plan.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Assay eye plaque I-125 seeds.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Perform a post implant survey.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Perform a post removal survey.

Signature / Date	

Signature / Date	
Signature / Date	
Signature / Date	

Practical Factors – HDR (Rotation II)

Import and evaluate TG186 test cases from IROC Houston (http://irochouston.mdanderson.org/rpc/BrachySeeds/Varian_database.htm)

Signature / Date	

Perform morning QA independently.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Perform/participate in annual QA.

Signature / Date	

Review and perform a BED and EQD2 calculation.

Signature / Date	
Signature / Date	
Signature / Date	

Generate test and/or clinical HDR prostate treatment plans.

Signature / Date	
Signature / Date	
Signature / Date	

Practical Factors – LDR Therasphere (Rotation II)

Calculate activity required for Therasphere treatment.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Assay Therasphere vials before and after the infusion.

Signature / Date	
Signature / Date	
Signature / Date	
Signature / Date	

Brachytherapy Case Participation

Document participation in planning (including anonimyzed cases), checking, delivering, and administrative paperwork of following implants.

HDR Cylinder (single or multi-channel)

	Date	Supervisor	Note
1			
2			
3			
4			
5			

HDR Tandem-based applicators

	Date	Supervisor	Note
1			
2			
3			
4			
5			

HDR Interstitial Gyn

	Date	Supervisor	Note
1			
2			
3			
4			
5			

HDR Interstitial Prostate

	Date	Supervisor	Note
1			
2			

3			
4			
5			

** HDR test cases are available under the patient name "$QA_HDR, Test patient" (Reg # jip03). Instructions for use are located under the shared directory, \Physics\2010 Teaching\Physics Residents\Rotations\Brachytherapy and rad safety rotation.

LDR Therasphere

	Date	Supervisor	Note
1			
2			
3			
4			
5			

LDR Eyeplaque

	Date	Supervisor	Note
1			
2			
3			
4			
5			

LDR Prostate

	Date	Supervisor	Note
1			
2			
3			

Others

	Date	Supervisor	Note
1			
2			
3			
4			
5			