**Ministry of healthcare of the Republic of Kazakhstan**

**The Kazakh Scientific Research Institute of Oncology and Radiology**

**SILLABUS**

**for students of the residency on the specialty 6R112000 "Radiation therapy"**

**Discipline**

**«Medical physics»**

The amount of teaching hours-360 hours/8credits

including:

Practical training-120 hours

Independent work -240 hours

Form of control: examination

**Almaty, 2017**

The syllabus is compiled according to the Model curriculum, the Residency Educational Program for the specialty "Radiation Therapy", the Instruction Letter No. 8 for the development of educational and methodological documentation in the organizations of the Republic of Kazakhstan, which are preparing for the residency approved by the Republican Center for Innovative Technologies of Medical Education and Science of the Ministry of Health of the Republic of Kazakhstan on April 27 2010 (Protocol No. 4).

Approved at the meetingRadiological Board

(Protocol №7 of "August" 25, 2017)

**Responsible for discipline: Mukhametkhan G.**

**Kim S.I.**

**1.** **General information**

1.1 Kazakh Scientific Research Institute of Oncology and Radiology (address: Almaty, Abai Ave., 91)

1.2Clinical base (clinical and diagnostic units of KazNIIOiR): department Day hospital for radiotherapy, Department of Clinical dosimetry and physical and technical support of radiation therapy, Department of Radiation Diagnostics.

1.3 Specialty: 6R112000 "Radiation therapy"

1.4 Discipline: "Medical Physics"

1.5 The amount of study hours: 360 hours / 8 credits

1.6 Information about teachers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **№** | **First and last name** | **Post** | **Academic degree** | **Priority**  **interests** |
| 1 | Mukhametkhan  Guldana | Head office  Clinical dosimetryand physical and technical support of RT | - | medical physics |
| 2 | Kim  Svetlana Ivanovna | Medical physicist | - | medical physics |

1.7 Contact information:

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1.8 Policies and Procedures. The policy of discipline consists in the consistent and purposeful implementation of the educational process. Teachers' requirements for residents are based on general principles of education in higher educational institutions of the Republic of Kazakhstan:

* compulsory clothing: standard medical gown or surgical form; indoor shoes; medical mask (carry)
* strict observance of labor discipline in basic institutions
* active participation in the educational process (preparation of theoretical material, solving situational problems and tests, mastering practical skills); attendance of classes, participation in pre-radial treatment of patients (including stage of ultrasound, CT-topometry), in planning and conducting radiotherapy sessions
* mandatory night duty in accordance with the approved plan
* compulsory maintenance of general and specialized medical documentation
* regular self-improvement (working in the library and with the Internet)
* adherence to the principles of medical ethics and deontology in relation to patients and colleagues
* timely informing mentors and the head of the department about temporary incapacity for work or other reasons for absence from the workplace
* penalties: if you miss 3 lessons for disrespectful reasons, work off in the form of night duty and prepare presentations on the topics of missed classes with subsequent protection. Passes of classes for valid reasons are worked out by self-preparation with protection of presentation on missed topics.

**2 Program**

**2.1 Introduction**

The training of highly qualified medical personnel with modern knowledge, skills and practical skills sufficient to provide qualified medical and diagnostic care is an important state task, the solution of which is possible only in the conditions of continuous postgraduate education.The training of qualified physicians - ray therapists is a complex and urgent problem. This program includes the amount of modern knowledge, skills and habits of the resident in the main specialty (radiation therapy) on the basis of the principles of evidence-based medicine with the training of qualified radiological medical personnel.

In this discipline, questions of the physical fundamentals of radiotherapy and its technical support are presented. The notion of clinical dosimetry as a science is given. An important link in understanding radiation damage to a tumor is the study of the radiobiological basis of radiotherapy, which subsequently leads to the development of morphological and functional changes, both in cells and in the tissues and organs of the patient. It is also important to create safe working conditions when dealing with sources of ionizing radiation, in connection with which knowledge of the hygienic fundamentals of radiation safety in radiation therapy is necessary.

**2.2 The purpose of the discipline** is to acquire and improve theoretical and practical knowledge on the physical basis of radiotherapy and its technical support.

**2.3 Tasks of the discipline:**

1) To create special knowledge on the physical, radiobiological basis of radiotherapy and its technical support.

2) Develop knowledge on nuclear physics and clinical dosimetry, hygienic fundamentals of radiation safety in radiation therapy.

3) Mastering the basic methods of radiation therapy and its hardware.

**2.4** **Independent work**

|  |  |  |
| --- | --- | --- |
| **№** | **Table of contents** | **Number**  **of hours** |
| 1 | Participation in pre-radial treatment of cancer patients | 24 |
| 2 | Participation in radiotherapy planning (delineation of clinical volumes and critical organs, analysis of dose-volume histograms) | 24 |
| 3 | Participation in the conduct of medical documentation on the specialty profile (filling out radiation forms) | 24 |
| 4 | Studying of separate themes with the help of slides and other teaching aids:  - Types of ionizing radiation.  - Interaction of radiations with matter.  - Basics of clinical dosimetry.  - Equipment for remote radiation therapy.  - Brachytherapy equipment.  - Dosimetric planning of radiation therapy.  - Quality control in radiotherapy.  - Radiation safety in radiation therapy. | 24 |
| 5 | Preparation of abstracts. | 24 |
| 6 | Preparation for seminars. | 24 |
| 7 | Reports of residents on the training troupe with the subsequent discussion of individual topics on the physics of radiation therapy | 24 |
| 8 | Participation in reports and discussions of complex clinical cases with the demonstration of the forthcoming radiotherapy plan at the planning stage | 24 |
| 9 | Work in the library, with the Internet | 24 |
| 10 | Forming the resident listener's portfolio | 24 |
|  | **Total hours** | **240** |

**2.5 Material and technical equipment**

• Linear Accelerators "Сlinac 2100 С/D", "TrueBeam"

• Remote gamma device "Teragam" with Co60 source

• Brachytherapy apparatus "GammaMediX plus" with source Ir192

• Computerized radiation planning systems "Eclipse", "BrachyVision", "PlanW 2000"

• Information system of radiotherapy "ARIA"

• Dosimetric equipment: automated systems for scanning radiation beams MP3, clinical dosimeters Unidos, ionization chambers, anthropomorphic phantoms, quality control equipment

• X-ray computer simulator "Acuity SSTT"

• Mobile X-ray machine «BV Endura»

**2.6**  **Recommended literature**

Mainliteratute:

1. KostylevV, Narkevich B. Medical physics.-m.: Moscow, 2008.-p. 126-155.

2.   Radiation oncology physics: A Handbook for teachers and students. IAEA, Vienna, 2005.

3. Handbook of physics irradiation. Theory and practice. Edit by Mayles p. Nahum, a. Rosenwald, J.C. 2007.

4. Setting up a irradiation programme: clinical, medical physics, radiation protection and safety aspects. International Atomic Energy Agency, Vienna, 2008

5. Nurgaziev K.,Sejtkazina G. etc. Indicators of the RK of the oncology service for year 2012 (statistics).-Almaty, 2013.-98 p.

6. MalakhovskyV., Trufanov G. Radiation safety during radiation therapy//scholastic-methodical allowance for doctors-2011.

7. Law RK about «Radiation safety» from 23.04 1998 No. 219- (I).

8. Hygienic sanitary-epidemiological requirements to ensure radiation safety approved by order of the Minister of national economy of the RK from 27.02.2015, no. 155.

9.  "Sanitary-epidemiological requirements to objects of public health" resolution of Government of RK from January 17, 2012 year no. 87.

10. "Sanitary-epidemiological requirements for radiation-dangerous objects", approved by the order of the Acting Minister of national economy of the RK from 27.03.2015 № 260

11. "Sanitary-epidemiological requirements for radiation safety», approved by the order of the Acting Minister of national economy of the RK from 27.03.2015 g.No. 261.

12. Fotina I. Radiotherapy basics. Remote radiotherapy.-ed. Tomsk Polytechnic University, 2010.-103 with.

13. JarmonenkoS. Radiobiology of humans and animals.-m.: vysshayaShkola, 1988.-424 p.

Additional literature:

1. Khan f. Physics of Radiation Therapy-2010.

2. Prescribing, Recording and Reporting Photon Beam Therapy//ICRU Report 50 (MKPE 50).

3. Prescribing, Recording and Reporting Photon Beam Therapy//ICRU Report 62 (MKPE 62).

4. Prescribing, Recording and Reporting Photon Beam Intensity-Modulated Radiation Therapy//ICRU Report 83 (MKPE 83).

5. Transition from 2-D Irradiation to 3-D Conformal and Intensity Modulated Irradiation.-IAEA.-2008.

6. IAEA (International Atomic Energy Agency), Absorbed dose determination in external beam irradiation: An international Code of Practice for dosimetry based on standards of absorbed dose to water, Technical Report Series No. 398, IAEA, Vienna, 2000.

7. Barrett a. Dobbs, j., Morris s., Roques t., Practical Planning Irradiation, 2009

8. Quality assurance in radiotherapy//Rep. researcherScient. Conference-Almaty, Kazakhstan, September 2002, 23-26.

9. Radiation Biology: A Handbook for teachers and students. IAEA, Vienna, 2010.

10. TelguziyevaZh., ZholdybayZh.,Shibanova A. etc. Cervical cancer: epidemiology, pathogenesis, diagnosis, treatment (review of literature)// «Hygiene, epidemiology and Immunology» -Almaty 2011,№2 (48)-P.12-15.

11. TelguziyevaZh., Goncharova T. Study of pharmacokinetics of methotrexate in tumors and in plasma of experimental animals // «Hygiene, epidemiology and immunobiology».-Almaty, 2011. -№4 (50)-Р.161-163.

12. TelguziyevaZh. Philippenko V., ZholdybayZh., Kim S. Application of techniques of complex medical visualization in an estimation chemoradiationtherapy of the cancer are //ESTRO Anniversary.-London (UK), 8-12 May 2011-p. 309.

13. TelguziyevaZh. Metronomic chemotherapy with gemcitabine at radical irradiation of the cancer are//The 17th int. Meeting of the ESGO-Milan (Italy), September 11-14, 2011-p. 58.

14. TelguziyevaZh., Kim S., Bainazarova A. The survival rate of patients with cancer are at use of a combination of chemical radiomodificators and radical irradiation//The 18th International meeting of the ESGO-October 19-22, 2013. -Liverpool, UK. -P. 269.

15. TelguziyevaZh., Kim S., Bainazarova A. Perspectives of metronomic chemotherapy in the treatment of cancer are radiological//The 18th International meeting of the ESGO-October 19-22, 2013.-Liverpool, UK-P.794.

16. Ishkinin E., Ongarbaev B., TelguziyevaZh., Kim S. Availability of high-tech methods for the treatment of prostate cancer population in Kazakhstan//Oncology and radiology of Kazakhstan-Almaty, 2016.-№1 (39)-Р.50-54.

17. IshkininE., Ongarbaev B., Kim S., TelguziyevaZh.etc. Experience brachytherapy for prostate cancer //Oncology and Radiology Journal (special issue).-Almaty, 2017.-Р.108

18. IshkininE., Ongarbaev B., Kim S., TelguziyevaZh. etc. Experience brachytherapy for prostate cancer //Oncology and Radiology Journal (special issue).-Almaty, 2017.- P.161

19. Telguziyeva Zh., TrushchenkoO., Kaibarov M. Application of intensevly-modulated radiation therapy in the treatment of locally-common forms of malignant head and neck tumors.// Oncology and Radiology Journal (special issue). -Almaty, 2017. -P. 164

20. TelguziyevaZh.,Filippenko V. Patent №22356 invention «Method of treatment for cervical cancer» (15.03.2010)

21. Telguziyeva Zh.,Filippenko V. Patent №22490 invention «Method of treatment for cervical cancer» (17.05.2010)

22. Telguziyeva Zh.,Filippenko V. Patent №23075 invention «Method of integrated Ultrasound techniques to evaluate the efficiency of combined radiation therapy for cervical cancer» (15.11.2010)

23. TelguziyevaZh., BaimahashevaA., Filippenko V. etc Patent №23100 on invention «Method of treating patients with cervical cancer» (15.11.2010)

24. TelguziyevaZh.,Filippenko V., ZholdybayZh. etc. Patent №23404 from 15.12.2010 on the invention of «The way to improve the effectiveness of radiation therapy for cervical cancer»

25. Periodic protocols for diagnosis and treatment of malignant neoplasms (2012, 2015).

26. «The clinical guide to oncology» //Almaty, 2016.

27. Act implementing the master-class «High-tech radiotherapy-radiosurgery» in KazNIIOiR (31.03-04.04.2016)

28. Act implementing the master-class «High-tech radiation therapy radiation oncology (joint master class for radiologists and medical physicists)»in KazNIIOiR (28.06-02.07.2016)

29. Act implementing the master-class «High-tech radiation therapy radiation oncology» in KazNIIOiR (18.10-22.10.2016)

30. IshkininE., Kim V., Ibraimova M. etc. Radiation treatment of patients with kidney cancer with metastatic bone lesion // V Congress of oncologists and radiologists Kazakhstan-Almaty 2014.-№180-Р.106-107

31. IshkininE., Kim V., Antropova T. etc. Evolutionary development of radiotherapy for prostate cancer in the Republic of Kazakhstan // V Congress of oncologists and radiologists Kazakhstan-Almaty 2014.-No. 181-c. 107

32. Kim V., IshkininE., Almabek A. etc. Pre-radialtopometry training in 3d conformal and intensely-modulated radiation therapy, experiences in Kazakhstan // V Congress of oncologists and radiologists in Kazakhstan. -Almaty, 2014-No. 185-P. 109-110

33. Malignant tumors of testicular, prostate cancer, renal cell carcinoma, bladder cancer// Periodic protocols of diagnostics and treatment of malignancies.-Almaty, 2012.-325-377

34. Guide for the target groups of the male population screening for early detection of prostate cancer and ensure its quality// NurgaliyevN., Zhylkajdarova A., Ishkinin E., edited by m.d. Kyrgyz Republic Shmone, m.d., Prof. M.K. Alchinbaev-revision and additions. -Almaty, 2014. - 71 p. ISBN 978-601-80100-8-8

35. Early diagnosis of prostate cancer at the level of primary health care. Guidelines//ZhylkajdarovaA.,NurgaliyevN., Ishkinin E., edited by m.d. Kyrgyz Republic Author, revision and additions. -Almaty, 2014. -26 p. ISBN 978-601-80100-7-1

36. Ishkinin Y., Kim V., KossymbayevaY. Fractionation modes of radiation therapy for kidney cancer patients with bone metastasis//Irradiation and Oncology Journal of the ESTRO # 33, volIII supplement 1 april 2014, ISSN: 0167-8140 p 533 # EP-1372

The syllabus was developed in accordance with the working curriculum, discussed at the meeting of the Scientific Council of KazNIIOiR(Protocol №7 from "August" 25, 2017)

**Responsible for discipline: Mukhametkhan G.**

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