



Arthur G. James Cancer Hospital & Richard J. Solove Research Institute
The Ohio State University, Radiation Oncology
MEDICAL PHYSICS RESIDENCY TRAINING PROGRAM

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PROGRAM OUTLINE



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1.0 Program Overview

1.1 Program Objectives

The Department of Radiation Medicine at the Arthur G. James Cancer Hospital & Richard J. Solove Research Institute offers a two-year residency program in Radiation Oncology Medical Physics. The Residency Program is designed for individuals with an M.S. or Ph.D. (D.Sc.) degree who seek training in clinical radiation oncology physics in preparation for a clinically oriented career. The Program's objective is to provide clinical training in radiation oncology physics that will prepare the graduate for board certification and a professional career in radiation oncology.

This Residency Program training involves full participation of the physics resident in the clinical routine under the supervision of experienced radiation oncology physicists. Comprehensive training and experience is provided in the areas of clinical dosimetry, treatment planning, treatment aid design and fabrication, brachytherapy, radiation safety, radiation machine calibration, and quality assurance.

Training from this Program should prepare the graduate for certification in the specialty of Therapeutic Radiological Physics by the American Board of Radiology and/or Radiation Oncology Physics by the American Board of Medical Physics. Graduates of the Program will have received sufficient clinical training that should prepare them for work as a radiation oncology physicist.

1.2 Organizational Structure

The Radiation Oncology Medical Physics Residency Program is a program within the Arthur G. James Cancer Hospital & Richard J. Solove Research Institute's Division of Radiation Oncology. The Arthur G. James Cancer Hospital & Richard J. Solove Research Institute is a Comprehensive Cancer Center located on the campus of The Ohio State University (OSU). The hospital and university work together to provide the highest quality of patient care, cutting-edge research, and excellence in education. The residency program faculty consists of physics and physician faculty within the Department of Radiation Medicine in the OSU Medical School and the radiation oncology technical staff of the Arthur G. James Cancer Hospital Radiation Oncology Division.

Presently, in the Department of Radiation Medicine, there are six Attending Radiation Oncologists and four physician residents. More than 1500 new patients per year are seen in consultation, providing exposure to a wide variety of pathologies, both adult and pediatric, as well as therapeutic modalities. The Radiation Physics group consists of 5 physicists (4 faculty and 1 clinical physicist), 4 medical dosimetrists, 12 radiation therapy technicians and 2 brachytherapy technicians. Three faculty in the Division of Radiation Biology provide the biology teaching. As a unique resource, Professor Andre Wambersie is a visiting professor who gives a lecture series on applied clinical radiation biology, radiation protection, and the recommendations of the International Commission on Radiological Units. The Physics Residency program is currently designed for 2 physics resident positions (one first year and one second year). Our physics residents receive training in both external beam radiation therapy and brachytherapy with access to a wide range of dosimetry instrumentation, radiation treatment planning systems, simulators, and treatment machines.

The Division of Radiation Oncology also offers a certified Residency Program for Medical Radiation Oncologists as well as a certified Radiation Therapy Technician Training Program. The medical physics residency program will be integrated with these programs in many of the didactic areas.

1.3 History of Program Development

Although we have just started our formalized Medical Physics Residency Training Program, over the past 10 years four Medical Physicists have been trained at The Ohio State University and are successfully placed in the community. The educational backgrounds of these trainees have been in Biomedical Engineering, Nuclear Engineering, and Physics. Three of the four candidates who have completed their training, did so while completing their graduate degree programs and spent 16 to 20 hours a week in Radiation Oncology for different lengths of time, as listed in the appendix. Two of these three candidates were funded as Graduate Assistants through Radiation Oncology for the duration of their residencies, while the third candidate was supported by the Department of Nuclear Engineering. Our fourth trainee started as a volunteer, but completed his residency funded through Radiation Oncology as a Research Associate. Our previous and current residents were not recruited through a formal application process. Candidates who approached us with interest in a residency were interviewed by faculty to judge their interest, motivation and academic background, and only candidates who convinced the faculty in all these respects were accepted.

We currently have one Resident in training: Dr. Jeff Woollard. He has been supported for the past year and a half as a Research Associate. He was the first resident that has followed a didactic curriculum along with



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performing Medical Physics duties with our staff and faculty. Our hospital has recently committed to the support of 2 Medical Physics Residents. Dr. Woollard will be converted to a Medical Physics Resident starting July 1. He will graduate in June 2004.

A detailed list of residents who have completed their training here is included in the appendix.

2.0 Training Requirements

2.1 Requirements for Program Completion

The Medical Physics Residency Program is a two-year program and consists of both clinical training as well as didactic coursework. In order to complete the program, the resident must successfully complete both components. Successful completion of the clinical rotations is based on evaluations performed by the supervising physicist at the end of each rotation. Successful completion of the didactic coursework is obtained by achieving a passing grade in each course.

While in the Program, the Resident may choose to become involved in a research project. Given the resources, and the wide variety of radiation therapy modalities implemented, in the Division, ample research opportunities exist for the Resident. While not a requirement, participation in a research project allows the Resident to benefit from Faculty scholarly experience and to learn the principles of scientific inquiry and critical analysis.

2.2 Training Essentials – Design and Content

The training provided in the Medical Physics Radiation Oncology Residency Program has been developed consistent with the guidelines provided in AAPM Report Number 36, “Essentials and Guidelines for Hospital-Based Medical Physics Residency Training Programs”. As mentioned in the previous section, the training provided consists of both clinical training and didactic coursework. The training to be completed by the Resident in each year of the program is discussed in the sections that follow.

2.2.1 First Year

During Year 1, the Resident will complete a clinical orientation rotation. This will involve spending time at the simulator, on the treatment machines and in dosimetry. This rotation will occur early in the first year and will allow the Resident to become familiar with the overall patient flow within the Division as well as the physicists role in the clinic.

The resident will also complete all didactic coursework during this year. Didactic coursework consists of classes provided by The Medical Radiation Oncology Residency Program and the Radiation Therapist Technician Training Program at the James Cancer Hospital, as well as several courses provided by The Ohio State University. Detailed descriptions of these courses, along with course syllabi, are provided in the appendix.

The Resident will also complete a dosimetry rotation. During this rotation the Resident will become familiar with the calculations performed, and the software used, by the medical dosimetrist. The Resident will learn to independently complete external beam therapy treatment plans. This rotation will occur after the completion of coursework so that the Resident will already be familiar with dosimetric calculations. Therefore, this rotation may extend into the second year. The dosimetry rotation, as well as the clinical orientation rotation, are described in detail in the appendix.

During the remaining time, the Resident will observe and assist the physicists in clinically related tasks, including treatment planning, dose calculation, and brachytherapy procedures, as well as performing machine calibrations, dose measurements and Quality Assurance checks.

2.2.2 Second year

During Year 2, the resident will complete a series of clinical rotations. In general, the resident is assigned to a supervising physicist for a period of three months. Since our physicists’ services are not specialized to any particular function, the Resident will be exposed to the practice patterns for each physicist, uniform within the guidelines of the Division, but individually different enough to provide a real world experience. At the end of each rotation, the Resident will be evaluated by the physicist to whom he/she was assigned. If the resident has not performed satisfactorily, the program director may counsel, advise, and/or test the Resident. The program director may then declare the rotation as not satisfactorily completed after due discussion with the physicist involved and all Medical Physics Faculty. This action will delay the candidate's admission to the Board examination and may require additional training. The Program Director meets with each resident at least twice yearly to discuss progress. A more detailed discussion of the clinical rotations to be completed by the resident is presented in the appendix.



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Physics residents also participate in all department conferences in which the physics staff is expected to attend. These include (1) Patient Management Conference, (2) Planning Conference, (3) Clinical Oncology Conference, (4) Morbidity Conference, and (5) Current Case Review Conference.

2.3 Program Length

The Medical Physics Residency Program is a two-year program and is currently designed for 2 physics resident positions, one first year and one second year resident.

2.4 Training Administration

Training program review is an ongoing task and is the responsibility of the Physics Residency Committee. The training essentials and clinical physics rotations are generally reviewed once a year. As part of this yearly review, the Program Director meets with all residents individually and as a group to get feedback for the program. A form is used for this evaluation and is included in the appendix. If changes are needed to meet the needs of the Program, then the Physics Residency Program Director targets the appropriate faculty for that task. Modifications require submission by the faculty to and subsequent approval by the Physics Residency Committee.

Physics Residency Program: Resources

3.1 Faculty and Staff

The faculty of the Radiation Oncology Physics Residency Program represents the foundation and strength of our Program. All of our faculty provide clinical support to the Arthur G. James Cancer Hospital Radiation Oncology clinic and most have appointments at The Ohio State University. The faculty has a broad teaching expertise and access to a wealth of clinical physics equipment and training resources.

A list of the faculty that contributes to our Program, as well as a biographical sketch for each, are included in the Appendix. The faculty comprises a broad range of expertise within radiation oncology physics. The faculty and staff interact regularly through (1) clinical physics staff meetings, (2) seminars, (3) case conferences, (4) quarterly departmental faculty meetings, (5) hospital or medical school committee meetings, (6) Physics Residency Committee meetings, and (7) annual retreats of the Department's faculty.

The faculty-resident interactions occur at (1) clinical physics rotations, (2) classroom environment, (3) seminars, (4) private appointments to discuss clinical rotation or personal problems, and (5) social activities (Physics Division parties, etc.). The residents also have access to the Program Director and Medical Director to discuss sensitive personal or training problems. We feel there is relatively open communications between residents, faculty, Program Director, and the Medical Director.

3.2 Financial

Effective July 1, 2004, the following funding levels are in effect for physics residents (funding levels for 2004 TBA):

1st year Physics Resident:	\$36,000
2nd year Physics Resident:	\$36,000

In addition to direct compensation, physics residents are afforded benefits consistent with other hospital employees including medical and dental insurance, paid vacation and holiday benefits, sick pay benefits, life insurance and disability insurance. The expense of these benefits varies and is shared between the physics resident and the Arthur G. James Cancer Hospital.

3.3 Facilities

3.3.1 Resident Offices, Classrooms, and Conference Rooms

The Physics Residency Program provides office space for each resident in the program. The Resident Office is currently located in the Physics area in the Division of Radiation Oncology in the James Cancer Hospital. This room is in the same area as the Program Director's office and the other Medical Physicist's offices. The room has the capacity for 2 physics residents. Residents are provided a desk, file cabinet, bookshelves, computer connected to a LAN, telephone access, and standard office supplies. Residents have access to departmental copying equipment. Resident space is approximately 40 sq. ft. per resident.



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Ample space is available for resident advisory meetings, didactic lectures, exams, seminars, and oral examinations. Didactic lectures are presented in our modern conference room, which is equipped with the latest multimedia equipment and on-line links to information sources.

3.3.2 Clinical Facilities, Laboratories, and Shops

The residents have access to a wide variety of clinical facilities, as well as a machine shop. Residents submit work orders to the machine shop as required; they are not allowed to personally use the machines. The availability of dosimetry and clinical treatment areas and equipment is adequate to serve the needs of the residency training program. Clinical facilities are listed below. Procedures are in place that (1) allow the resident reasonable access time to clinical equipment, 2) provide residents sufficient training and technical support to ensure safe and proper use of equipment, and 3) to ensure equipment is left in the proper state for clinical use.

Clinical and Dosimetry Resources

External Beam Treatment Machines:

1. 2 Siemens KD2 Linear Accelerators (Dual Photon and 5 Electron Energies – one with MLC and IMRT capability) – one of them to be replaced in July by a Siemens Oncore Linear Accelerator (Dual Photon and 6 Electron Energies and MLC and IMRT delivery)
2. 1 Siemens MXE-2 Linear Accelerator, 6 MV Photons and 3 Electron Energies and IMRT delivery
3. 1 Siemens MX Linear Accelerator, 6 MV Photons only.
4. 1 Siemens MXE Intraoperative Radiotherapy Electron Linear Accelerator located in a shielded Operating Room.
5. 1 Elekta Gamma Knife Unit

Simulators:

1. 1 Nucletron Simulix HP Simulator, with Digital Imaging.
2. 1 Nucletron Simulix Y Simulator
3. 1 GE HiSpeed DXI CT scanner and Advantage Sim CT Simulator

Treatment Planning Systems

1. Nucletron – Helax TMS external beam 3D treatment planning system with IMRT planning: 3 workstations
2. Nucletron – Theraplan Plus Image Based Brachytherapy Planning system
3. Varian Eclipse TPS
4. Varian Brachyvision TPS
5. Abacus HDR treatment planning software
6. Gammaplan: Gammaknife stereotactic radiosurgery planning system
7. CMS / Burdette Real Time Ultrasound guided prostate planning system
8. CMS/ Burdette CT based prostate post-seed dosimetry planning system
9. Varian/MMS Prostate LDR Planning System
10. Nucletron Oncentra Treatment Planning system

Brachytherapy

1. Varian – Gammamed 12i HDR Remote Afterloading Unit
2. Ultrasound guided interstitial implant system
3. Traditional intracavitary (Cs-137) and interstitial (Ir-192) brachytherapy sources
4. Eye plaques
5. Intravascular Brachytherapy

R&V/PACS



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1. Siemens LANTIS record and verification system
2. ImageRT Radiation Oncology Picture Archival and Communications System for managing all radiation oncology films and images.
3. Agfa – hospital wide diagnostic PACS system.
4. Agfa – Computed Radiography system for Portal Imaging

Dosimetry Resources

1. NIST – traceable calibrated ion chamber and electrometer dosimetry systems
2. Farmer type ion chamber and Electrometer systems
3. Various small volume Ion chambers
4. Parallel-plate ion chambers
5. Multiple Well Ionization chambers for assaying brachytherapy sources.
6. Scanditronix-Wellhoffer Water Phantom scanning software
7. TLD Dosimetry system
8. Diode based In-Vivo dosimetry system for Photons and Electrons, with computerized data collection.
9. RIT and Scanditronix-Wellhoffer film scanning and densitometry systems with VIDAR VXR 16 dosimetry Pro scanner.
10. Radiochromic densitometer
11. Sensitometry equipment
12. Multiple Solid water phantoms
13. IMRT QA phantom
14. Alderson-Rando anthropomorphic phantom
15. Barometers, thermometers, etc
16. Ion-chamber based morning output check devices for each linear accelerator
17. Multiple radiation survey meters

3.3.3 Libraries

The major libraries available to students are the Prior Health Sciences Library and The Ohio State University Main Campus Library. Students also have access to the Division of Radiation Oncology Library (the William G. Meyers Library), which maintains volumes of Medical Physics, Physics in Medicine and Biology, and the International Journal Radiation Oncology, Biology, and Physics. Medline accounts are available for the residents for manuscript keyword/author searches.



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ADMISSION CRITERIA & PLANNED DIDACTIC CURRICULUM



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1. Residents

1.1 Admissions

All trainees entering the Radiation Oncology Physics Residency program are required to have acquired a strong foundation in basic physics as documented by a master's or doctoral degree in medical physics, physics, engineering, mathematics, or other science with physics training equivalent to a minor in physics. Interested applicants are provided with the following material:

1. A description of our Residency Program
2. A list of documents available from AAPM headquarters explaining the field of medical physics and residency training including:

AAPM's "The Medical Physicist",
AAPM's "The Roles, Responsibilities, and Status of the Clinical Medical Physicist,"
AAPM's "A Guide to the AAPM",
AAPM Report No. 36, "Essentials and Guidelines for Hospital-Based Medical Physics Training Programs,"
AAPM Report No. 38, "Statement on the Role of a Physicist in Radiation Oncology"

3. Physics Residency Program Application

Upon receipt of the candidate's completed application, transcripts, and letters of recommendation, the applicant's packet is forwarded to members of the Physics Residency Committee who then rank the candidates. The scores are summed and the top candidates are contacted by phone to initiate the interview process. All candidates contacted by phone are encouraged to visit the facility. Members of the Physics Residency Committee then interview those that visit. In addition, references are contacted by phone to supplement the recommendation letters. The Physics Residency Committee then meets and reviews the interview results, and any other pertinent information regarding the applicants, and then rank orders the candidates that were included in the final cut. A position is first offered to the top candidate. If the selected candidate declines the offer, or does not respond in a timely fashion, the position is offered to the next seeded candidate. A letter is sent to all unsuccessful candidates thanking them for their interest in our Residency Program and encouraging them to continue to seek admittance to this field of training. The interview process is performed in accordance with the equal opportunity standards of both The Ohio State University and the Arthur G. James Cancer Hospital & Richard J. Solove Research Institute.

1.2 Recruitment Efforts

An announcement for the Physics Resident positions is made in January of the year training is to commence. This is accomplished via the AAPM Job Placement Announcement. The advertisement describes the training program and provides instructions concerning application to the program. In addition, a letter is sent each year to the Program Director of each CAMPEP accredited medical physics degree program announcing the availability of the open physics residency position and asking their help in making their pending graduates aware of the opportunity.

1.3 Number of Residents

The Physics Residency Program is designed to handle a maximum of 2 residents.

1.4 Evaluation of Resident Progress

Residents are monitored through the program by an assigned faculty for each clinical rotation. Periodic meetings between the physics resident and the Program Director are held to discuss problems related to resident training. Successful completion of the clinical rotations is based on evaluations performed by the supervising physicist at the end of each rotation. Successful completion of the didactic coursework is obtained by achieving a passing grade in each course.

At the end of the first year, the Physics Resident is expected to be able to perform quality assurance tests, monitor unit and dose calculations, 2D and 3D treatment planning, radiation safety procedures, and brachytherapy



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physics procedures and planning with minimal guidance from a supervising physicist. By the completion of the two year term, the physic resident is expected to be able to perform all radiation oncology physics functions, including full calibrations of treatment machines, checks of dosimetry work (treatment plans, etc.), radiation safety procedures, clinical consultations, and patient-related dosimetry.

1.5 New Resident Orientation

New physics residents are provided a one-day orientation lecture series followed by a two-week clinical orientation rotation in the clinic and dosimetry areas at the beginning of their training. In addition, the Program Director meets with each new resident at that time to ensure the incoming resident clearly understands the program's requirements, resident administrative procedures, and any other expectations. At this meeting, the resident is made aware of staff and program resources, including treatment machines, treatment planning facilities, laboratories and libraries.

4.0 Physics Residency Program: Program Administration

2.1 Structure Within the Hospital and Medical Center

In accordance with the Principles of Affiliation between the Arthur G. James Cancer Hospital and the OSU School of Medicine, residents are employees of the hospital and are subject to Hospital policies and procedures. The content of the residency program, however, is developed and administered by the Physics Residency Program Director, an employee of The Ohio State University. Hospital administration and University Administration work together daily to ensure consistency and coordination.

The Physics Residency Program Director is Dr. Nilendu Gupta. The Program Director is responsible to the Division of Radiation Oncology Chairman, Dr. Reinhard Gahbauer. Program administration is the responsibility of the Program Director and the Physics Residency Committee.

2.2 Role of Program Director

The Program Director is responsible for program administration, which includes the following:

- Correspondence with prospective trainees
- Scheduling of prospective residents visits
- Hospital appointments
- Scheduling of classrooms for faculty lectures
- Scheduling of Physics Residency Committee meetings
- Scheduling of faculty staff meetings
- Preparation of agenda & minutes of Residency Committee and faculty/staff meetings.
- Preparation for resident orientation
- Administrative support for residents
- Program correspondence
- Preparation of clinical rotation schedule
- Preparation of didactic lecture schedule
- Initiation of Physics Residency Program Review

The Program Director follows guidelines established by the Physics Residency Program Committee, The Ohio State University Medical College, and the Arthur G. James Cancer Hospital in administering the program. Dr. Gupta is assisted by Dr. Christos Kanellitsas, Associate Directors of the Physics Residency Program, Mr. Tim Nelson, Radiation Oncology Administrative Director, Mrs. Patty Werner Chief Dosimetrist, and Mr. David Carpenter, Residency coordinator for Radiation Oncology.

2.3 Role of Physics Residency Committee

The Physics Residency Committee is responsible for the following tasks:

- Resident recruitment
- Admission recommendations
- Monitor physics resident's progress
- Training curriculum



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Orientation program
Committee meetings
Program review

2.4 Records Maintained

The following records pertaining to the Radiation Oncology Physics Residency Program are maintained: (1) applications, (2) transcripts, (3) letters of recommendations, (4) Physics Course lecture schedule and course syllabi, (5) clinical rotation schedules, and (6) evaluation records. These files are maintained and located in the Physics Residency Program Director's office.

3.0 Didactic Component for Residents without Medical Physics Background

Based upon the residents background in Medical Physics, if it is determined by the Residency Committee that the resident needs to include a formal didactic component (other than the Physics in-service lecture series and other conferences) to cover areas of deficiency in their didactic background, the Residency Committee will make a recommendation to the candidate to complete such courses. The Division of Radiation Oncology offers a number of courses that will be available to the candidates at no charge and are listed in items 3.1 and 3.2 below. Additionally several courses are offered and available at the University that the Resident may need to take. Such courses are available at no charge through the University Fee Authorization Benefit that is available to the Residents (except for taxes that are charged for that benefit by the University, as required by the IRS). However, the time spent by the Resident taking courses has to be made up through participation in routine Physicist activities after hours (QA's, Yearly checks, new installations, other measurements, etc.), so that the Clinical contact hours are not compromised through this process.

3.1. Courses Offered through the Radiation Therapist Program

- a. Radiation Physics I & II
- b. Radiation Techniques I & II
- c. Medical Ethics
- d. Medical Terminology
- e. Radiation Protection
- f. Dosimetry Calculation I & II
- g. Treatment Planning
- h. Clinical Radiation Oncology
- i. Quality Assurance
- j. Pathology
- k. Brachytherapy

3.2. Relevant Course offered to Medical Residency Program

- a. Radiation Oncology Physics and Board Review
- b. Brachytherapy/Clinical Oncology Lecture Series
- c. Radiation Dosimetry and Treatment Planning

3.3. Courses Offered through the University

- a. Anatomy
- b. Radiologic Anatomy
- c. Physiology
- d. Radiation Biology (Radiology 680)
- e. Medical Physics (Radiology 670)
- f. Individual Studies in Radiological Physics (Radiology 760)
- g. Advanced Topics in Radiological Physics (Radiology 880)
- h. Research in Radiological Physics (Radiology 999)