A GUIDE FOR MEDICAL PHYSICS RESIDENTS IN RADIATION ONCOLOGY

The University of Pennsylvania Medical Center

I. ABOUT THE UNIVERSITY OF PENNSYLVANIA MEDICAL CENTER

The University of Pennsylvania Medical School was founded in 1765 as the nation's first school of medicine. The Hospital of the University of Pennsylvania (HUP) founded in 1874 is the first university based hospital. The current hospital facility consists of 789 patient beds located in the Dulles Building, Founders Pavilion, Gates Building, Maloney Building, Ravdin Building, Silverstein Pavilion, White Building, the Rhoads Building, Penn Tower and Raymond and Ruth Perelman Center for Advanced Medicine (PCAM). The University of Pennsylvania has become an internationally renowned medical center with established expertise in almost every medical specialty.

The Penn Medicine Abraham Cancer Center is one of 69 National Cancer Institute designated cancer centers in the United States. The purpose of the cancer center is to conduct basic and clinical research, undergraduate and postgraduate training, and to develop new and innovative treatment programs. The programs are interdisciplinary. There are currently 314 members of the cancer center with representatives from the School of Medicine, School of Veterinary Medicine, Dental Medicine, Engineering, Nursing, Wharton School, and faculty of the School Art and Sciences. The full range of cancer therapies are offered at the Abramson Cancer Center's main building, PCAM, including proton therapy at the Roberts Proton Therapy Center and through the Hospital of the University of Pennsylvania, Penn Presbyterian Medical Center, Pennsylvania Hospital, and Chester County Hospital.

The Corporal Michael J. Crescenz VA Medical Center (VAMC) located in Philadelphia is affiliated with the University of Pennsylvania. Medical students, interns, and residents rotate through the VAMC. Certain subspecialties are the responsibility of the Allegheny Medical College of Pennsylvania, however, Hematology, Oncology, Radiation Oncology, Surgery and the surgical subspecialties are the responsibility of their parent departments at HUP.

The Children's Hospital of Philadelphia (CHOP), founded in 1855, is the oldest pediatric hospital in the United States. It currently is a 520-bed facility adjacent to the Hospital of the University of Pennsylvania. Radiation oncology is provided by HUP's Department of Radiation Oncology.

The Penn Presbyterian Medical Center was founded in 1871 and in 1995 formally joined the University of Pennsylvania Medical Center. HUP's Department of Radiation Oncology provides radiation therapy for Penn Presbyterian Medical Center.

Pennsylvania Hospital is a 534-bed hospital located about 2 miles from the University of Pennsylvania. It was established in 1751 and was the first hospital in the United States. It has a separate radiation oncology department, where residents may receive training in special procedures such as brachytherapy, Gamma knife and CyberKnife.

II. RADIATION ONCOLOGY at PCAM

General Information

The Department of Radiation Oncology at PCAM was established in 1977. In June 2008 the department moved to a new facility in the Raymond and Ruth Perelman Center for Advanced Medicine from HUP. Presently, the department is staffed by approximately 18 Ph.D.'s and 29 M.D.s with subdivisions in Medical Physics and Radiation Biology. The treatment services at other facilities in the Delaware Valley, which include Philadelphia Veterans Administration Hospital, Penn Presbyterian Medical Center, Pennsylvania Hospital, Chester County Hospital, Doylestown Hospital, Penn Medical Valley Forge, Penn Medicine Cherry Hill and Chestnut Hill Hospital are also provided by the department. Equipped with five state of the art Varian linacs with on-board imaging, one Varian Gammamed Plus afterloader, two 4-D CT simulators, one dual energy CT, a wide bore 1.5T MRI unit, a PET-CT unit and two acuity simulators, the department provides a wide variety and high quality services to our patients. In early 2010 the Robert Proton Therapy Center started operation. The cyclotron based therapy system has four gantry treatment rooms and a fixed beam room. The system is capable of delivering double scattered beams and pencil beam scanning. Innovative features include a multileaf collimator for scattered and and CBCT on the proton gantries. In general, Penn Medicine delivers a broad range of radiation therapy services to is patients, including conformal radiation therapy (CRT), intensity-modulated radiation therapy (IMRT), image-guided radiation therapy (IGRT), high-dose rate (HDR) brachytherapy, partial breast irradiation, stereotactic radiosurgery (SRS), Cyber Knife, Gamma Knife, total body irradiation (TBI), total skin electron beam therapy (TSEBT) and proton therapy.

Clinical Staff

The clinical staff for the department includes approximately 29 board-certified radiation oncologists. Their clinical practices are predominantly disease oriented with each staff physician responsible for patient care and clinical research activities for a particular set of disease site. The department has established a national and international reputation in the treatment of pediatric malignancies, lung cancer, brain tumors, breast cancer, genitourinary and gastrointestinal malignancies, gynecologic malignancies and lymphomas, as well as radiation sensitizers, radio protectors and photodynamic therapy.

Medical Physics Division

The medical physics division is composed of faculty physicists, staff physicists, medical physics residents, post-doctoral fellows, mechanical and electrical engineers, and dosimetrists. Medical physicists are involved in clinical service, consultation regarding treatment techniques and radiation physics concepts, providing technical support to dosimetrists, research, commissioning, calibration, alignment, preventive maintenance and servicing of equipment. The educational role includes the training of future medical physicists, residents, physicians and radiation therapists. The dosimetry division uses the Varian Eclipse treatment planning systems with 3D, IMRT, RapidArc and proton planning capabilities. The ARIA record and verify system is used for both conventional and proton therapy.

Computing and Network

The Computing and Network team is responsible for the medical informatics support of the department. This includes electronic collaboration, and support of research and clinical

care. A 250 node Wide Area Network (WAN) composed of PC's and other workstations spans the department.

Radiation Safety Office
The University Radiation Safety Office maintains the radiation exposure history of every individual classified as a radiation worker and makes such records available to the worker on request. It notifies workers when permissible levels are being exceeded. It functions under the authority of the University of Health Physics officers.

Radiation Biology Division
The Division of Radiation Biology is staffed by approximately thirteen Ph.D. scientists conducting biologic and biochemical. The preclinical research efforts are enhanced with an advanced photon small animal treatment core facility (SARRP) that is integrated with a dedicated proton research room.

Social Service
A social worker is available through the hospital and helps the patient and family to recognize and articulate their questions, concerns, and fears regarding treatment and prognosis. The social worker acts as a liaison between the patient and family and various agencies within the community (i.e. nursing home, psychiatric facilities, home nurse services, counseling agencies), for financial assistance, and providing transportation to the hospital, if necessary. The social worker is also responsible for arranging out-patient transportation for those patients that need it.

Nurses
The radiation oncology clinic and treatment areas are staffed by registered nurses and nursing assistants. Nurses provide counseling to patients with regard to radiation side effects and supportive care. They are present for procedures such as pelvic examinations and biopsy procedures and aid in scheduling laboratory studies and x-rays. They direct the order in which patients are to be seen. They are responsible for supplies in the examining room and are available to assist physicians and to attend to the general needs of the patients. This team also includes nutritionists and patient care coordinators who assist patients through the hospital system, coordinating flow from other departments.

PCAM Clinic
The receptionists in the out-patient clinic receives and greets all patients arriving in the department and processes billing information for all patients arriving for follow-up and consultation visits. They are responsible for coordinating future follow-up appointments and diagnostic studies.

Billing Clerk
Billing clerks are responsible for acquiring all necessary demographic information on new patients, entering this information into the computer databases. They will certify that all patient insurance concerns are addressed obtain pre-certification and clearance for treatment in of all new patients our facilities.

Administrative Assistant Staff
The administrative assistant staff provides academic and clinical support for the staff physicians. They are responsible for correcting transcriptions and other correspondence

and sending out patient correspondence including history and physicals, on treatment visit notes, completion summaries, follow-up notes, etc., for both the staff physician, as well as the resident assigned to that service. They are responsible for maintaining the staff physician's appointment book. They receive and schedule consultations, both in-patient and out-patient, for the appropriate physician. They are responsible for filing correspondence on all patients under treatment. They are also responsible for notifying patients of missed appointments and scheduling new ones.

Technical Staff
The technical staff in the treatment area consists of a chief therapist, several assistant therapy supervisors as well as staff and student radiation therapists. All staff therapists are registry certified in radiation oncology. The therapists are responsible for the delivery of the prescribed daily treatment, acquiring weekly portal images for quality assurance, emergency treatments on nights and weekends, simulations and HDR brachytherapy procedures as well as other special procedures in the clinical setting.

Library Facilities
Library facilities include the Penn Biomedical Library which also offers poster and 3D printing services. Most journals and electronic database such as Pubmed, Scopus, Web of Science searches are available online when accessed from the Penn network.

Ill. DEPARTMENTAL ADMINISTRATION

Department Chair
The department chair is Dr. James M. Metz the Henry K. Pancoast Professor of radiation oncology. The chair must approve all requests for departmental funding for the residency program and individual residents. The chair will make the final determination regarding any termination or corrective action. The chair will communicate any relevant departmental policies or issues that pertain to all residency programs.

Vice Chair and Director of Medical Physics Division
Dr. Lei Dong is the vice chair and Director of Medical Physics. The Director of Medical Physics oversees all research, clinical and educational activities of the division. The Director of Physics will make the final recommendation regarding any termination or corrective action to be taken in the Division of Medical Physics to the Chair of the department.

Director of the Medical Physics Residency Program
The director of the residency training program is Kevin Teo, PhD. He is responsible for all aspects of the physics resident training program. The program director will meet with each resident individually at the end of each rotation to review their progress in the residency, in-training exam results and any educational concerns on the part of the program director or resident. The program director is the chairperson of the Education Committee, and will meet with that committee approximately quarterly to discuss residency program issues. The director is available to residents to help with individual or collective problems and represents the residents at periodic staff meetings.

Associate Director of the Medical Physics Residency Program

The associate director of the medical physics residency program is Shibu Anamalayil, MS. He assists the director of the residency program and helps in coordinating clinical and didactic training of the residents.

Residency Program Coordinator
The residency program coordinator is Willene Blair. She maintains all residents' academic files and all confidential correspondence and evaluations, and may be contacted to make an appointment to review their contents. The coordinator will provide organizational support for the residency program and physics students' rotations and assist the residency program director. The coordinator also administers the recruitment and interview process for residency applicants. The coordinator attends and provides minutes for all Education Committee meetings. The coordinator is responsible for coordinating resident's benefits and payroll. Any problems or errors on the check, such as taxes, benefits withholding, etc, should be brought to the attention of Willene Blair. Reimbursements for meeting travel or other are submitted to Willene Blair.

Office Coordinator
The office coordinator for the Medical Physics division is Willene Blair. The office coordinator will provide administrative support for the residency program activities and assist the residency program director.

Financial Admin Coordinator
The financial admin coordinator is Christie Foti. She is responsible for accurate records of personnel activity including all hiring, payroll and benefit functions

IV. MEDICAL PHYSICS RESIDENCY PROGRAM

General Information
The medical physics residency program in radiation oncology is a two-year program in an academic institution which offers a complete range of treatment techniques. The program is designed to conform and incorporate the standards approved by the Commission on Accreditation of Medical Physics Educational Programs (CAMPEP). Our purpose is to set standards that provide uniform high quality clinical medical physics education. This includes didactic instructions and varied physics clinical experience. There are 9 rotations covering a wide range of clinical practice in the period of two years. The locations of the rotations include PCAM and satellites. During each rotation, a resident will be assigned to a faculty and a staff physicist who mentor the resident to accomplish the assignments of literature reading and practical practice respectively.

Requirements of the Residency Training Program
The specific requirements necessitate that an individual applying to this program must have a formal undergraduate education in physics or a related science, followed by advanced studies in an appropriate graduate program. To ensure the safety of our patients and the quality of the care we offer, it is essential that the knowledge and competence of individuals applying to our program be of high standards. For those applicants who have not graduated from an accredited medical physics education program, appropriate didactic training will be provided and successfully completed within the duration of the residency and must not interfere with clinical training. All residents must complete the curricula of the residency program.

All residents must log their exposure in extramural conferences. The resident must maintain an up-to-date, detailed list of all procedures in which he/she participates. All procedures must be logged into the residency program database. The procedure log must be submitted to the Program Director at the end of rotation meeting. Residents are required to fulfill all requirements for each rotation. Residents are further required to adhere to all physics residency policies as outlined in this policy manual.
The physics core curriculum shall include experience with simulation, basic and advanced treatment planning across the 9 main cancer treatment sites, treatment delivery, uncharged and charged beam data commissioning and QA, instrument calibration, special procedures (radiosurgery, brachytherapy, etc.), proton therapy procedures, radiation safety, licensing and the general practice of clinical physics. In addition, the curriculum will provide instruction in anatomy and radiation biology based on their clinical applicability. The core curriculum may be expanded with other areas as the field of radiation oncology develops. The mentor faculty/staff physicist must ensure that the resident personally performs all activities pertaining to each rotation.

Volunteers, Graduate and Postgraduate Students Activities: Clinical activities can be coordinated in conjunction with the medical physics residents, but must receive the Program Director's prior approval.

CONFERENCES
Intradepartmental clinical conferences at PCAM
A Didactic Lecture Series is given regularly. Residents and faculty are responsible for presenting a didactic lecture on a selected topic in a formal slide presentation. The topics include review of the AAPM Task Group (TG) reports, case study, review of literature and the updates of research projects. Didactics are organized in site-specific and clinical physics topical modules and are coordinated with the other weekly conferences. Residents must find a mentor for each Medical Physics Seminar and place on the Medical Physics Residency drive the material to be presented 2 weeks in advance. Residents need to remind the mentors that the attendance of the mentors to the lecture is mandatory.
Morbidity and mortality conference is held quarterly, and is part of the confidential departmental quality assurance program. The physician faculty will submit cases of morbidity or mortality that directly result from their radiation treatment. A MD resident will review and present each case along with the relevant medical literature. The physics resident will review all dosimetry aspects pertaining to the case.

Imaged based Anatomy Course
The anatomy lecture series is given in the fall of each year by William Levin MD for residents and attending staff. This course includes didactic lectures on imaged based anatomy across the main 9 cancer treatment sites.

Radiation Biology Course
The radiation biology lecture series is given in the spring of each year by the radiobiology staff for residents and attending staff. The course coordinator is Costas Koumenis, PhD. This course includes didactic lectures on all aspects of radiation effects on normal and neoplastic tissue.

Radiation Physics Course

The clinical radiation physics lecture series is given in the fall and winter and is specifically designed for the education of medical residents in radiation oncology physics. The course coordinator is Dr. Ali Kassaee.

Medical Physics Course
The medical physics course in the Medical Physics Master Program is given in the fall and winter by Jarod Finlay, PhD. and is specifically designed for education in Medical Physics. This course includes didactic lectures on all aspects of radiation oncology physics

Research requirements
All residents are encouraged to complete at least one clinical research project during their residency. Completion of a research project is defined as submission of a manuscript for publication in a peer-reviewed medical journal. Therefore, research projects conducted by residents should be of publication quality. Projects must be overseen by a mentoring departmental faculty member. Progress on a project should be discussed monthly with the mentoring attending faculty member. Progress will be discussed during the quarterly evaluation with the residency program director.

Resident Evaluations
At the end of each rotation, the resident's performance is evaluated by the responsible faculty/ staff physicist member. Faculty should make every effort to help residents with any problem during a specific rotation. Evaluations should be reviewed with the resident by the responsible faculty member and the form signed by each at the completion of each rotation. Evaluations will be sent to the Program Coordinator and are made available to the Director of Physics and the Chair of the department. Evaluations will be reviewed with the program director at the end of each rotation meeting with the resident. Evaluations will be discussed at Educational Review Committee meetings held regularly. Residents are required to evaluate each staff member on the appropriate forms at the end of each rotation and these evaluations will be submitted to the program director and are made available to the Director of Physics and Chair of the department.

Examinations
All residents are required to take an oral exam at the end of the following clinical rotations- basic treatment planning, advanced treatment planning, beam data, brachytherapy, proton therapy and special prodecures (CyberKnife, GammaKnife). At the end of each year of residency training, an ABR part 3 style mock oral exam will be administered. Residents are required to pass both annual exams in order to graduate.

Resident Supervision
In order to ensure patient safety and quality patient care while providing the opportunity for maximizing the educational experience of the physics resident in the hospital setting, it is expected that a faculty/physics staff member will be available for supervision during clinic hours.

RESIDENT RESPONSIBILITIES
The resident will participate in all activities as indicated by the curriculum and all physics activities which involve his/her faculty/staff physicist's assignments according with the

clinical schedule. All activities will be performed according with hospital, departmental, state and federal regulations.

Machine QA
After an introductory period of 3 months the resident is responsible for carrying out all machine routine QA procedures according with departmental policies under a faculty/staff physicist's supervision. It is the resident's responsibility to inform a faculty/staff physicist within 24 hours of any deviation within 3%, and immediately about any deviation over 5%, unless indicated otherwise by the departmental policy.

Equipment inventory and calibration
The residents will take turns in being in charge of the IMRT QA equipment inventory and will keep an updated log of the equipment. Each resident will be in charge of the inventory for about 3 months.

In vivo Dosimetry
After an introductory period of about one month the resident is responsible for carrying out all the in vivo dosimetry measurements according with departmental policies under a faculty/staff physicist's supervision. It is the resident's responsibility to inform the photon team within 24 hours of the results of the measurement.

Brachytherapy Procedures
The resident will be involved in planning and delivery of brachytherapy treatment under the supervision of a qualified medical physicist as required by federal, state and departmental regulations.

Physics and Clinical implementation projects
All residents will participate in Physics and Clinical implementation projects as requested by their mentor or program director.

Weekend On-call
At the end of External Beam Rotation I: Basic Treatment Planning, the first year residents will be competent in 3D conformal planning. The residents will be assigned to cover weekend on-call duties together with a staff or faculty physicist and is responsible for planning the emergency cases. The resident will take roughly one weekend per two month for weekend on-call duty. In the week prior to taking up on-call duties, the resident will practice making a 3D plan which is then checked by a staff or faculty physicist. The resident's on-call schedule is prepared by the Chief Resident, subject to review and approval by the Program Director.

DEPARTMENTAL POLICIES FOR RESIDENTS
Vacation, Conferences, Maternity Leave, and Corrective Action
Residents are permitted 20 working days of vacation time during any one academic year. Residents are requested not to take vacation during the first week of any rotation and no more than two weeks of vacation time may be taken during a single rotation. Any time off taken during the Christmas and New Year holidays must also be taken as vacation time. Requests for vacation at the holidays should be submitted to the Program Director so that departmental coverage may be arranged.

Vacation less than 4 days must be requested in writing using the appropriate form at least 2 weeks in advance. Vacations more than 4 days must be requested at least 1 month in advance. The faculty member overseeing the resident's rotation must approve and sign the vacation request. All departmental absences will be recorded by the program coordinator. Any vacation requests that are submitted with less than two weeks' notice must be approved by the program director. The resident must submit an explanation in writing for such requests. Acceptable reasons for such requests include family or personal illness or other emergencies or a death in the family.
While at satellite facilities or outside rotations, vacations must be approved by the supervising staff and program director. Vacation request forms are to be forwarded to PCAM as soon as they have been approved by the supervising faculty member at the satellite or affiliated facility. All vacation requests must be approved by the program director and cannot exceed 2 weeks per rotation.

Sickness and Leave
If a resident is ill for a prolonged period of time (absence longer than seven consecutive days), the Director of Physics may consider the resident to be on leave for medical reasons and continue paying his/her salary for the period up to the time that long term disability comes into effect per university and health system regulations.

Dress Code Policy for Physics Residents:
All residents are to dress in visibly clean, presentable clothes. All residents must have clean and short nails. Residents must be aware of the importance of wearing clean and appropriate clothes. Men should wear ties and no jeans or shorts is permitted during clinical hours. Scrubs can be worn while working with patients and while performing brachytherapy cases. A single plain band ring can be worn, but special care with hand washing is essential. Wristwatches must be removed when undertaking clinical care. Residents are expected to wear their ID badge at all times. The appearance of the residents is of paramount importance to us as we believe that pride in our appearance enhances the educational process because it focuses resident's interests in the academic program and not in physical appearance.

Corrective Action
I. Corrective Action
Physics Residents may be disciplined for failure to adhere to appropriate patient care, moral, ethical, academic or professional standards; failure to properly complete records in a timely manner; violation of the policies, procedures, or requirements of the Department Policy Manual.
The Director of Physics and Training Program Director of the Physics Division shall be responsible for discipline. The Director of Physics or Program Director will meet with the resident and provide oral or written justification for the discipline. If a second disciplinary action is required, the following examples of disciplinary actions may be utilized by the Director of Physics or Program Director.
1. Oral notification to Chairman with details of the problem.
2. Written notification to Chairman with details of the problem which could include copies of documents or other materials such as "letters of complaint, attendance logs, or written response and submission of materials from the program.
3. Additional supervision or specific directives for the resident with clear educational goals and performance expectations.

4. Counseling, medical evaluation, unpaid leave of absence.
5. Probation.
If a Physics Resident desires to speak or meet with a neutral party in an effort to resolve a conflict, he/she should contact the University or Hospital's Human Resource Department.

II. Suspension and Termination
Residents shall be suspended, terminated or removed from direct clinical physics activities if: their conduct presents an immediate threat to the well-being or safety of patients, staff, and hospital employees after a probationary period, the resident continues to not meet institutional or departmental standards and it appears that remedial action will not rectify the problem.

Meetings and Travel
There is a $2,500 annual budget allocated per resident per year. No travel arrangements should be made before approval of the program director. Approval forms must be submitted to the Program Director at least one month in advance and must accompany signed/approved absence forms. Travel to additional meetings may be supported for residents presenting papers at those meetings at the discretion of the Program Director or Director of the physics division. Residents should discuss planned time off with the appropriate faculty staff on whose rotation this will occur. Any requests for travel to AAPM or ASTRO should be submitted well in advance (at least two months). Requests for attending AAPM or ASTRO will be considered on a first-come, first served basis, with priority given to those presenting papers and to senior residents scheduling interviews.

Reimbursement of Expenses - Travel
Travel procedures include: 1) a form entitled "Request to Allocate Funds" must be completed by the resident at least one month prior to the meeting and approved by the Program Director 2) a form entitled "Request for Absence from the Department" must be completed by the resident and signed by the program director, as well as the faculty member on whose service the absence will occur; 3) after returning from the trip, a form entitled "Request for Reimbursement of Travel Expenses" must be completed and submitted to the Program Coordinator and accompanied by original receipts for airfare, train, auto rental, meeting registration, hotel bills, etc. Certain expense guidelines must be followed in order that reasonable costs being maintained, such as meal cost, cab, etc.

Reimbursement of Expenses - Books and journal subscriptions
A $350 per year allowance will be provided for each resident for professional books and journal subscriptions.

Keys
Keys to the department will be supplied by Willene Blair. They should not be copied.

Smart phones
Smart phones will be provided by the department during the residency period. On the termination of the residency, the smart phones are required to be returned back to the department. The phone numbers could be transferred to the graduating residents for personal use on the request from the graduating residents.

Benefits
Life insurance is provided based on health system or university policy.

Health insurance
Health insurance is available to residents and eligible dependents through a variety of providers. The resident must select the plan of his/her choice. Vision care, dental care, and a prescription plan with a deductible are available after completion of one year of service.

Payroll banking programs are available with direct deposit of paychecks to designated banks.

Retirement plans may be available. Participation is voluntary.

Substance Abuse
The health system is eager to assist residents with a substance abuse problem and encourages any trainee with a substance abuse problem to contact his/her program director or the Director of Physics for assistance. The health system will not discipline any member of the house staff for his/her self-disclosure. Selfdisclosure will not, however, excuse a violation of any other policy or dereliction of other duties.
Residents who use illegal drugs or abuse controlled substances or alcohol are encouraged to seek help from available resources. The University of Pennsylvania or UPHS employee assistance program is available for all house staff who require assistance. Program directors are required to make information known to all Residents about the availability of this assistance.
A member of the Physics Residency Program who violates the policy may be subject to disciplinary action, including termination. At the discretion of the health system or university, the trainee may be referred to an assistance program and may be required to participate in and satisfactorily complete a chemical abuse rehabilitation program as a condition of continued trainee status.

Counseling Services
Counseling services to residents are available according with the resident benefits.