PHYSICS RESIDENCY HANDBOOK

DEPARTMENT OF RADIATION ONCOLOGY

CITY OF HOPE MEDICAL CENTER

DUARTE, CA

TABLE OF CONTENTS

Table of Contents

Welcome Message

Dear Resident,

Welcome to the City of Hope (COH) Therapeutic Medical Physics Residency Training Program in the Department of Radiation Oncology! The goal of this Residency Program is to produce highly skilled and compassionate radiation physicist. A second, but important goal is for graduating physicists to be competent to participate fully in the advancement of the science of radiation oncology and will be capable of assuming leadership positions in the field. This is a two-year training program that emphasizes both in clinical excellence and career development in Radiation Oncology Physics. The residents are expected to learn both practical as well as theoretical aspect of clinical medical physics through on-the-job training. Residents will participate in all clinical services under the supervision of the program faculty. Residents will interact with physicists, physicians, dosimetrists, therapists, physics assistants, and other staff members daily to ensure safe and effective patient care. Residents are also expected to participate research activity and quality improvement projects during the residency. We expect that by the completion of training, Physics residents will be competent to practice radiation physics independently and professionally in any setting.

This resident handbook will serve as a guide during your residency. It provides an overview of the setup of our program, general expectations, and policies and procedures. If you have questions that are not covered in this handbook, please do not hesitate to let us know. We look forward to working with you and helping you develop into a competent and independent medical physicist.

Sincerely,

An Liu, PhD, DABR, FAAPM

Director, Medical Physics Residency Program

Kun Qing, PhD, DABR, DABMP

Associate Director, Medical Physics Residency Program

Residency Program Overview

City of Hope

City of Hope is a private, not-for-profit clinical research center, hospital and graduate medical school located in Duarte, California, United States. The center's main campus resides on 110 acres of land adjacent to the boundaries of Duarte and Irwindale, with a network of clinical practice locations throughout Southern California. After the recent acquisition of Cancer Treatment Centers of America, it expands the service to Arizona, Illinois, and Georgia.

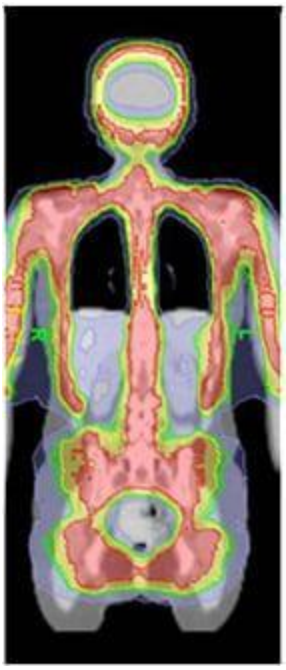
City of Hope's institutional goals are the prevention, treatment and cure of cancer and other life-threatening diseases, including diabetes and HIV/AIDS. As such, City of Hope's programs include the fields of brain, breast, gastrointestinal, gynecologic, thoracic and urologic cancers, as well as leukemia, lymphoma, and diabetes. City of Hope is one of only 52 National Cancer Institute-designated comprehensive cancer centers in the U.S. The NCI designation recognizes excellence in treatment, research and expertise to address the many facets of the disease. City of Hope is also a founding member of the National Comprehensive Cancer Network (NCCN), reflecting our national leadership in advancing research and treatment. NCCN member institutions are recognized for their world-renowned experts and for treating complex, rare and aggressive forms of cancer.

Department of Radiation Oncology

The Department of Radiation Oncology at City of Hope has had a long tradition in forging new advances and translating new discoveries into the clinic, such as the first in the US to use focused ultrasound to treat prostate cancer, one of first institutions adopted biological-guided radiation therapy machine (refleXion). The department offers the latest therapeutic and imaging technologies. This includes Tomotherapy and TrueBeam, which allow one machine to do the work previously done by several: imaging of the tumor, mapping its exact shape and “sculpting” a radiation beam to the tumor. This maximizes its impact against cancer cells while sparing nearby healthy tissue, resulting in less pain, less invasive treatment, faster healing and a shorter recovery time.

City of Hope’s advanced equipment and specialized staff have enabled it to become the first cancer center to deliver total marrow irradiation, as shown on the right. This targeted form of therapy focuses radiation energy to the bone marrow while limiting exposure in other tissues. As

a result, patients with blood cancers (such as leukemia, lymphoma and myeloma) — particularly those with advanced cases — have better outcomes, including the chance of complete remission. We have treated more patients with this therapy than any other center in the world.



Additionally, the center is the first in Southern California to integrate crucial cancer imaging technologies, such as positron emission tomography (PET), multi-parametric magnetic resonance imaging (MRI) and 3D CT imaging, with next generation therapy technologies. This allows our physicians today to offer patients an unprecedented access to the full capabilities of image-guided therapies. Cancers are now more visible and can no longer hide from therapy.

Overall Program Goal

The primary mission of the City of Hope Radiation Oncology Physics Residency Training Program is to produce highly skilled and compassionate radiation physicist. We expect that by the completion of training, Physics residents will be competent to:

- understand the role of patient safety in the clinical practice of medical physics;
- grasp the technical knowledge, skills and competency required for the safe application of the technologies used in the practice of medical physics;
- appreciate of the clinical purpose and applications of sophisticated technologies;
- understand the protocols and practices essential to the employment of technologies to detect, diagnose and treat various illnesses and injuries;
- be able to use analytical and research methods to solve problems arising in the clinical environment;
- be able to deploy new strategies within the clinical environment;
- be able to critically evaluate research and scholarship in medical physics;
- obtain the communication and interpersonal skills that are necessary to function in a collaborative, multidisciplinary environment;
- establish the professional attributes and the ethical conduct and actions that are required of medical physicists; and
- understand the value of career-long continuing education to keep professional knowledge and skills current.

Program Technology and Equipment

Helical RadiXact unit with ClearRT kVCT imaging.

Helical Tomotherapy/RadiXact unit.

Varian Ethos system

Varian TrueBeam Linear Accelerator with Millennium 120 mlc.

Varian TrueBeam STX Linear Accelerator with HD120 MLC.

RefleXion biology-guided radiotherapy (BgRT) unit.

Varian Linear Accelerator Clinac 2100EX

Varian Eclipse Treatment planning system

Elekta Oncentra High Dose-Rate BrachyTherapy unit with treatment planning System

Insightec MR Guided Focused Ultrasound

GE Big Bore CT simulator

GE 3T MRI simulator

GE PET/CT unit

Varian Aria Oncology Information System

Program Faculty

An Liu, Ph.D.

Kun Qing, Ph.D.

Bo Liu, Ph.D.

Borna Managhechi, Ph.D.

Chengyu Shi, Ph.D.

Chunhui Han, Ph.D

Jiahua Zhu, Ph.D.

Sam Hendley, Ph.D.

William Watkins, Ph.D.

Yelin Suh, Ph.D.

Yi Lao, Ph.D.

Tammy Railey, CMD

Medical Physics Residency Steering Committee

The operation and evaluation of the medical physics residency program is governed and overseen by the physics residency steering committee. The committee meets at least twice a year to review the education program and take actions to address issues and make improvements when needed.

The steering committee will consist of the following members:

Physics director, Physics residency director, Physics residency associate director, Chief dosimetrist, all rotation mentors, Chief physics resident, Physics residency coordinator.

The steering committee members are appointed automatically according to their roles/titles in the department. The change of rosters will be recorded/acknowledged at the start of each steering committee meeting.

The residency program coordinator Thalia Yaden attends the meeting and maintains the Minutes of meetings which includes a summary of actions that are proposed or taken.

Program Policies and Procedure

Please refer to the Graduate Medical & Clinical Education Training website at http://www.coh.org/gme/pages/default.asp, for information regarding all associated institutional policies.

Benefits and Salary

Subject to appointment and verification of eligibility, City of Hope offers the resident or fellow the Trainee and Affiliate Benefit Program. Details of coverage, co-payments, and options are provided in your orientation packet, in the Trainee Appointment letter, and at www.garnett-powers.com/coh .

Optional 403(b) retirement plan is available if Trainee elects to contribute. Additional term life insurance may be purchased by Trainee and dependents. Please refer to https://www.cityofhope.org/academics/graduate-medical-education/gme-trainee-benefits-agreement for detailed information.

The salary of the physics resident follows the medical resident salary scale. It is adjusted each year based on inflation and other factors. Please refer to https://www.cityofhope.org/academics/graduate-medical-education/gme-salaries-and-financial-information for the most up to date figures.

Holidays and Sick Leave

The Department of Radiation Oncology will follow the COH schedule for holidays. City of Hope observes six legal national holidays (New Year's Day, Labor Day, Memorial Day, Thanksgiving Day, Independence Day and Christmas Day) and provides up to an additional three paid personal days.

You are eligible to take up to 10 days per year pro-rated for use when illness or injury prevents you from working.

Professional Meeting Policy

Trainee making an oral presentation at AAPM or other professional society meetings will, at the discretion of the resident director, receive additional funding to attend. Request for additional funding must be submitted in writing to the program director at least 2 months before the meeting.

Attendance at any meeting that requires time away from the residency program assignment must be approved in writing by the program director prior to making any commitment to attend the meeting.

Residents are encouraged to become members of the AAPM and SCCAAPM. The annual dues for these societies will be reimbursed.

Leave Policies

A Trainee shall receive twenty (20) PTA days per academic year. PTA does not accrue from year to year and must be scheduled and taken in the same academic year earned. PTA shall be scheduled by mutual agreement with the Program Director and department and given as leave depending upon the mode of scheduling of a given service.

Absence from the Program to attend educational, scholarly, and/or professional activities must be scheduled with the approval of the Program Director.

With the approval of the Program Director, Trainees may take up to twelve weeks of leave within any 12-month period to attend to personal matters of a serious, time-consuming nature. Additional leave may be granted by the Program Director in his or her sole discretion. Personal leave taken in excess of allotted PTA is uncompensated, unless otherwise agreed upon between the Trainee and the Program Director. Personal leave may be appropriate for a number of reasons, including but not limited to the following:

1. for the birth of or to care for a newborn child of the Trainee;

2. for the placement of a child with the Trainee for adoption or foster care or to care for a newly adopted or new foster child;

3. to care for the Trainee’s Parent, Child, or other member of the Trainee’s Immediate Family, who is suffering from a serious health condition;

4. to care for the Trainee’s own serious health condition;

5. to address exigent circumstances caused by the military service of a Trainee’s spouse, registered domestic partner, Child, or Parent; and

6. to care for an Immediate Family member who is a member of the military and who has suffered a serious injury or illness while in the line of duty that renders the servicemember medically unfit to perform the duties of his or her office, grade, rank, or rating.

Trainees may take up to three days of paid leave for bereavement in the event of the death of a member of the Trainee's immediate family. This leave is in recognition of the need to grieve, attend to the decedent's affairs and/or attend a funeral or other ceremony, etc. Bereavement leave is granted in the following circumstances:

1. If the deceased is a member of the trainee's immediate family as defined in Appendix I below.

2. If the deceased is not a member of the trainee's immediate family, the trainee may still be granted leave, but such leave is subject to the approval of the Trainee's Program Director. Program Directors are encouraged to grant such requests whenever possible.

Requests for bereavement leave must be submitted as soon as possible and must be approved by the Trainee's Program Director.

All Trainees are eligible for military leave, as long as they comply with the applicable rules, including the following:

1. A Trainee who wishes to take military leave must first advise his/her Program Director of the need and reason for the leave at the earliest practicable time.

2. A Trainee who wishes to take military leave must submit written verification to the Program Director from the appropriate military authority.

Military leave taken in excess of allotted PTA is uncompensated, unless otherwise agreed upon between the Trainee and the Program Director.

Trainees who are required, by means of a summons or equivalent order, to serve as a juror or a court witness, will be granted time off in order to do so, in accordance with applicable law and provided an exemption has not been granted by the courts.

At the end of any leave period described herein, the Trainee shall return to his or her Program. **If the total "time off" (PTA+leaves) are less than 40 work days per year, the trainee can make up the missed training time during the 2-month elective rotation without having to extend the training period.** If the total "time off" exceeds 40 work days per year, the training period will have to be extended to account for the amount of leave taken.

Resident duty hours

Duty hours are defined as all clinical and academic activities related to residency; i.e. patient care (both inpatient and outpatient), duties relative to patient care such as machine QA, patient specific QA, chart reviewing, etc, time spent in-house during call activities, and scheduled activities, such as conferences. Duty hours do not include reading and preparation time spent away from the duty site.

Resident work hours in general are from 8:00am to 6:30pm. However, resident should not consider this as a rigid arrangement. The availability of the treatment machine may require physicists and resident to work after hours. Under those situations, the residents will be granted additional PTO time at the discretion of the residency director.

Trainee Grievance and Due Process Policy

The residency program maintains an "open door" policy for residents to discuss and resolve the administration of policies, interpersonal relationships, and work performance as they arise.

We do recognize that not all problems may be resolved during this informal procedure. Therefore, we have adopted a formal grievance procedure for residents that want to pursue a problem beyond the informal procedure. This procedure is designed to provide unbiased and

timely resolution of problems and will hold no adverse affect upon the resident as a result of utilizing this procedure.

Trainee Grievance Policy

Grievances pertaining to the training program, faculty or work environment that were not resolved through informal discussion should first be submitted in writing to the Division Chief within fifteen (15) days of the occurrence of the action identifying the matter as a formal dispute. Division Chief will respond in writing.

If the dispute is not resolved by these discussions, a Trainee who wishes to continue the matter shall file a written statement of dispute with the Department Chair within fifteen (15) days of receiving the response from the Division Chief.

The Department Chair or designee shall discuss the dispute with the Trainee and the appropriate individual or individuals in an effort to resolve the matter.

Trainee Problem Behaviors

It is understood that Trainees may exhibit behaviors, attitudes or characteristics which may be of concern and require remediation. It is a faculty's professional judgment as to when a Trainee's behavior becomes problematic. However, problems generally exist when one or more of the following is noted:

1. Trainee does not acknowledge, understand or address the problem when it is identified;
2. The problem is not merely a reflection of a skill deficit which can be remedied by academic or didactic training;
3. The quality of the services delivered by the Trainee is sufficiently negatively affected;
4. The problem is not restricted to one area of professional functioning;
5. A disproportionate amount of attention by training faculty is required;
6. Trainee's behavior does not change as a function of feedback, remediation efforts or time;
7. The problem behavior has potential for ethical or legal ramifications if not addressed;
8. The problem behavior negatively impacts others, including those on the Trainee staff.

Notification to the Trainee of Problem Behaviors and Remediation Alternatives: Once a behavior has been identified as problematic, there are several alternatives available to notify and meaningfully address the behavior of the Trainee:

1. Verbal Warning: Trainee is given a verbal warning to discontinue the inappropriate behavior.

2. Informal Remediation: A writing to formally advise the Trainee that the Program Director is concerned with a particular behavior/performance, that the Program Director and supervising faculty is committed to work with the Trainee to solve the problem or remedy skill deficits, and that the behavior is not significant enough at this time to warrant a formal warning. When the Trainee responds to the concern(s) and successfully completes the Informal Remediation Plan, the written acknowledgment is to be removed

from the Trainee's official file making the matter confidential for reporting purposes to any entity outside of City of Hope. The following parties must be involved in the decision-making process: Program Director, Clinical Competency Committee, and the Trainee involved.

3. A Formal Remediation: A written warning notifies the Trainee that they must discontinue an inappropriate behavior and includes these elements:

a. A description of the unsatisfactory behavior;
b. The actions needed to correct the unsatisfactory behavior;
c. A timeline for correction; and
d. What action will be taken if the behavior is not corrected (Schedule Modification, Probation, Suspension, Leave, Dismissal).

A copy of the Formal Remediation Plan, signed by the Trainee, Program Director, and the DIO will kept in the Trainee's file. The Trainee will be given an opportunity to submit their position in writing for the file. Please refer to the Disciplinary/Action Plan for required components necessary for the Formal Remediation Plan in accordance with ACGME guidelines.

When the Trainee responds to the concern(s) and successfully completes the Formal Remediation Plan, the written acknowledgment will remain in the Trainee's official file, but will remain confidential for reporting purposes to any entity outside of City of Hope.

Probation Period: Probation is a time-limited, remediation-oriented, more closely supervised training period in which the Trainee's ability to complete the Program is assessed. The Program Director will systematically document and monitor, for a specified length of time, the degree to which the Trainee addresses, changes, or otherwise improves a problematic behavior. The Trainee will receive a written probation letter which will include:

a. Specific behavior(s) associated with an unacceptable rating;
b. Recommendations for remedying the problem;
c. A time frame for correction;
d. Any schedule modification(s); and
e. The process to assess whether the problem has been appropriately remedied.

A copy of the probation letter will also be sent to the Legal/Human Resources. If there is a lack of sufficient improvement within the noted time frame to remove probation, the Program Director will discuss the situation with supervising faculty, the Clinical Competency Committee, Department Chair, Legal/Human Resources, and consider possible courses of action.

The Program Director will then communicate with the Trainee in writing to inform him/her that:

1) the conditions for revoking the modified schedule or probation have not been met;
2) the next course(s) of action to be implemented, such as continuation of remediation or implementation of another alternative; and

3) the Trainee's academic program director will be notified that if the behavior does not change, the Trainee will not successfully complete the Program.

Reporting of Probation: in accordance with ACGME, all Probation statuses are an official part of the Trainee's file and as such must be reported to a requesting entity outside City of Hope during employment verification or licensure.

Dismissal from the Training Program: Dismissal involves the permanent withdrawal of all responsibilities and permitted activities at COHNMC. After a reasonable period of time, if specific interventions do not remedy the problem behavior or concerns, and the Trainee seems unable or unwilling to alter their behavior, the Program Director will discuss with the Legal/Human Resources the possibility of termination from the Program and dismissal from the COHNMC Program. Grounds for dismissal from the Program may include:

a. Severe violations of the American Medical Association (AMA) Code of Ethics, or when imminent physical or psychological harm to a patient is a major factor;
b. Trainee's inability to complete the Program due to physical, mental or emotional illness; or
c. Trainee inability to remediate skill deficits that are necessary for completion of the Program.

Prior to dismissal from the Training Program, the Trainee will meet with the Legal/Human Resources, PD, and APD (if applicable) in a forum to discuss reasons for dismissal and appeal. Should dismissal be decided upon, Legal/Human Resources, and the Trainee will be notified in writing that the Trainee has been dismissed, without completion of the Program.

Withdrawal from Training Program: Withdrawal from Training Program involves the permanent withdrawal of all responsibilities and permitted activities at COHNMC. If a Trainee chooses to withdraw from a Training Program, the following should be submitted:

a. A letter of resignation to the PD and the DIO which includes a specific end date
b. Reason from withdrawal from Program

Schedule Modification: A schedule modification is a time-limited, remediation-oriented, closely supervised period of training designed to return the Trainee to a more fullyfunctioning state. This often occurs when the Program director decides that an accommodation needs to be made to assist the Trainee during a time of stress, with the full expectation that the Trainee will complete the Program. The Program Director will decide the length of the schedule modification in consultation with the Trainee's supervising faculty. Several possible courses of action may be taken, including one of more of the following:

a. Referral of the Trainee to the Well-Being Committee;
b. Increasing the amount of supervision with the same supervising faculty or other faculty;
c. Changing the format, emphasis or focus of the supervision;
d. Reducing the Trainee's clinical or other workload; e. Requiring completion of specific academic coursework.

Training Program Description

The residency program consists of 24 months clinical training through eight rotations at the City of Hope comprehensive cancer center, Duarte, CA. The training curriculum essentials comply with AAPM report No. 249 and CAMPEP guidelines. It consists of both didactic component and practical clinical component. The didactic component consists of attendance of physics, radiobiology, clinical lecture series and departmental journal club. Attendance is mandatory. Attendance of departmental multidisciplinary clinical conferences is also expected.

Educational Courses, Didactic Lectures and Clinical conferences

Radiation Physics Lecture series

Time: Wednesday afternoon.

Participation requirement: Recommend to attend for the 1st year. 2nd year resident is expected to teach on a few lectures.

New patient conference:

Time: Tuesday, Wednesday and Thursday mornings, 8:10-8:40

Participation requirements: Attendance, 60% averaged quarterly

Morbidity and Mortality Conference

Time: Quarterly, approximately 4 times per year

Participation Requirements: Attendance expected.

Medical Physics Journal Club and Topical Presentation:

Times: twice per month, approximately 24 times per year

Participation Requirements: Attendance required. each resident is expected to present 4-5 times annually. Residents will be mentored by appropriate faulty member.

Resident Orientation

The incoming resident receive orientations that provided by COH human resource to ensure proper understanding of institution rules and guidelines. In addition, they are oriented to the Medical Physics residency to become comfortable in the work environment and to be familiar with department-specific policies and procedures in the first week. The one-week orientation includes the education of shared drive structure, pager use, and safety training. The completion of Ethics module on AAPM is required. Residents are also encouraged to watch Ethics related presentations in AAPM virtual library.

Rotation Schedule

The practical clinical component consists of eight clinical rotations as listed below. Each rotation has its own goals and objectives content, and evaluation parameters.

- Treatment Planning (5 months)
- Linac design, Machine QA and Commissioning (4 months)
- Dosimetry Systems (3 months)
- Brachytherapy (4 months)
- Radiation Protection/Radiation Safety (1 month)
- Imaging and Informatics (2 month)
- Special Procedures (3 months)
- Elective (2 months)

Detailed training plans, training objectives, resident progress evaluation, and appropriate reading list is provided in each specific rotation documents. All electronic documents can be accessed from departmental shared drive.

The residents will be assigned clinical duties to independently practice skills learned during their clinical rotation. Should an actual clinical opportunity to perform tasks such as calculating radiation shielding, commissioning, etc. not present itself, relevant educational projects are to be undertaken. During each rotation, residents are assigned a faculty physicist to be their "rotation mentor." During the rotations focused on treatment planning, the chief dosimetrist serves as rotation mentor in addition to a faculty physicist.

Year 1	July	**Orientation & Treatment planning**
	August	
	September	
	October	
	November	
	December	**Linac design, machine QA and Commissioning**
	January	
	February	
	March	
	April	**Dosimetry System**
	May	
	June	
Year 2	July	**Brachytherapy**
	August	
	September	

October	
November	**Radiation Protection/Radiation Safety**
December	**Imaging and Informatics**
January	
February	**Special Procedures**
March	
April	
May	**Elective**
June	

1. Treatment and Planning Rotation - 5 Months: The treatment and planning rotation consists of two overlapping parts: Treatment Delivery and Treatment Planning.

Treatment delivery requires safe, operational mastery of the Varian Truebeam platform and the Accuray TomoTherapy platform through consistent performance of quality assurance (QA) including daily, monthly, and patient-specific QA institutional procedures under the direct supervision of a QMP.

Treatment Planning includes observing and producing 3D planning for multiple anatomical sites (Brain, Head and Neck, Lung & Esophagus, Breast, Abdomen & Rectum, Pelvis & Bladder, Skin, Sarcoma, whole CNS, and Prostate); and Dosimetry Planning Rotation-Advanced: with focus on Intensity Modulated Radiation Therapy (IMRT), Volumetric Modulated Arc Therapy (VMAT), Tomotherapy planning (Tomo), RefleXion planning, Stereotactic Body Radiotherapy (SBRT) and Stereotactic RadioSurgery (SRS). Theory understanding includes different 3D photon beam dose algorithms, electron beam dose algorithms, non-dosimetric calculations performed by the planning system (e.g., DRRs, contouring tools, etc.), dose evaluation tools, optimization, critical organ doses, parallel vs. serial organs, typical dose-volume constraints, etc. Understanding of simulation procedure of different clinical sites as well as the utilization of 4D-CT is also required.

The rotation concludes with an oral exam with topics organized by rotation leaders and an assessment of competency in treatment delivery including daily- and monthly linac QA, and in treatment planning of 3DCRT and VMAT IMRT.

2. Linear Accelerator (Linac) Design, Machine QA, and Commissioning - 4 Months: In this rotation, residents are expected to demonstrate a thorough understanding of Linac design, annual QA, and commissioning. Residents will develop an understanding of the acceptance and commissioning of Linacs and treatment planning systems. Residents will perform machine configuration, photon, and electron beam modeling with prior acquired data on Eclipse. Besides clinical training rotation, residents are expected to perform monthly and annual QA with physics faculty members to ensure hands-on experience with external beam machines including Varian

Truebeam and Accuray Tomothearpy systems and the associated calibration process and procedures.

The rotation concludes with an oral exam with topics organized by rotation leaders and an assessment of competency in performing Linac annual QA.

3 Dosimetry systems - 3 Months: During this rotation, the residents are expected to develop an understanding of the design and specification of various radiation measurement systems and demonstrated expertise in operation of radiation detector systems including ionization chambers radiographic and radiochromic film, diodes, thermo-/optically stimulated- luminescent dosimeters, EPID, diode arrays, and ion chamber arrays. Specific hands-on training will include brachythearpy well-type dosimeters in HDR source exchange and detection instruments used in LDR patient procedures.

The rotation concludes with an oral exam or a presentation organized by the mentor and a competency assessment in the ability to peform Linac calibration and HDR source exchange.

4. Brachytherapy - 4 Months: The brachytherapy rotation is based on two pillars: (4.1) the brachythearpy qualtiy assurance program and (4.2) brachytherapy patient treatment.

4.1 The brachytherapy quality assurance program includes commissioning & acceptance of hardware including brachytherapy applications and electronic equipment, commissioning and acceptance of software including treatment planning and delivery systems, operational and emergency procedures for remote afterloading HDR systems, and demonstrated expertise in HDR source exchange.

4.2 Brachytherapy patient treatment includes low dose rate (LDR) treatment of prostate, high dose rate (HDR) treatment of prostate and gynecological cancers, Xoft electronic brachythearpy for breast cancer, and Y90 liver injections for radioembolization.Demonstrated didactic expertise and a knowledge of the relevant literature for radioactive decay, source calibration, calculation of brachytherapy dose distributions, f implant dosimetry systems and techniques, and an overview of remote after-loader systems and various applicators. Residents are expected to be familiar with various clinical procedures of prostate seed implant, interstitial and intracavity HDRand perform those procedures under the supervision of board-certified physicists.

An oral exam will be provided at the end of the rotation in addition to an assessment of competency in HDR source exchange, HDR treatment planning, and HDR treatment delivery

5. Radiation Protection and Radiation Safety – 1 Month: In this rotation, the residents are expected to understand the general radiation safety with NRC and state regulations. Shielding designs include hand-on calculation of Linacs room, CT and PET/CT room, and HDR suite.

The rotation concludes with an oral exam and an overview of competency assessments from rotations 1-4.

6. Imaging and Informatics - 2 Months: In this rotation, residents are expected to gain thorough knowledge regarding image modalities used in radiation treatment. Residents are expected to follow patients through the simulation process using CT/conventional simulator /PET-CT, with an emphasis being on geometric aspects of the process (setup geometry specification, immobilization, marking, tattoos, CT including x-ray technique, and transfer to planning system). The resident is also expected to learn image match, image transfer, and image registration with different modalities. Quality assurance of every aspect of each IGRT system will be studied, from image acquisition through verification and treatment delivery. The resident will be given opportunities to observe the ultrasound and MRI-based planning and practice on related machine QAs. Basic imaging physics and the terms that impact image quality will be discussed between rotation leaders and residents. The design and application of different electronic portal imaging systems, and the necessary processes for commissioning and continuing quality assurance of portal imaging systems will be performed.

Residents are also expected to understand common information systems used in radiation oncology and methods to transfer, retrieve, storage, and security of clinical data.

The rotation concludes with an oral exam at the end of the rotation and an overview of competency assessments from rotations 1-4..

7. Special Procedures-3 Months: The rotation is designed to give the medical physics resident experience with special procedures such as SRS with Linacs, TBI/TMI (conventional method on Linac as well as IMRT/VMAT approach on TomoTherapy and Linac), TSET, 4DCT, DIBH. Residents will review key principles of SRS or hypofractionated stereotactic radiotherapy with conventional Linacs. The resident will participate alongside physics faculty in clinical SRS/SRT treatments. The rotation also prepares the resident to thoroughly understand the procedure of TBI and TSET. Equipment, dosimetry issues, field uniformity, beam energy/penetration, blocking, dose verification, patient positioning/set up, prescribing scheme, and shielding will be discussed. Commissioning data will also be provided to and discussed with the residents. The resident will understand the use of MIP, minIP, avg CT, and DIBH for different target locations. The rotation concludes with an oral exam organized by the mentor.

8. Elective – 2 Months: This 2-month block is reserved for the resident to finish up independent research or clinical projects, provided he/she has demonstrated competency in all clinical rotations according to assessment of rotations 1-4 . Residents may also use this to continue providing clinical physics services in a more independent manner. Or this can be reserved for remediation of previous clinical rotations. If needed, formal training in leadership and professionalism may be taken at this time.

Although the completion list is structured into 8 rotations, the completion of all of the items for any given rotation often extends before and beyond the scheduled rotation time. The purpose of the rotation schedule is to provide a reasonable time period in which that topic is the focus of the resident's efforts. For example, Linac QA may extend if demonstrated competency and expertise take longer than 1 year. The rotation schedule provides guidance in evaluating resident progress at various timepoints.

Medical Physics Resident Expectations

1. The resident is responsible for being proactive regarding their rotation obligations. This includes:
    a. Independently review and monitor clinical schedules for clinical area of rotation
    b. Shadowing physicist during clinical activities
    c. Be the primary point of contact for clinical issues during your rotation

    While the physicists/clinical staff try their best to include and update the residents on clinical occurrences, it is also up to the resident to proactively inquire and follow-up on any clinical activities they are interested in or should see for their rotation. To prepare for rotations the resident is expected to:
    a. Meet reading requirements as outlined in the Handbook
    b. Ask questions to help bridge any gaps between your assigned readings and the clinical competencies that are performed.

    The resident is also expected to work with the rotation mentor to preschedule the following meetings for each rotation:
    a. Initial Rotation Meeting (within the first couple of days of the beginning of rotation).
    b. Weekly meetings with Primary Mentor (to be discussed at initial meeting)
    c. End of Rotation exam within a week of completion of rotation.
2. Clinical service during residency training
    The resident is required to participate in mentor assigned clinical services under the supervision of the rotation mentor. In addition, resident is required to participate routine QA activities such as Daily, Monthly, Annual and IMRT QA and less frequent clinical and education activities, such as commissioning of new machine, source exchange, etc. Residency director will work with the Director of Physics to schedule clinical service tasks for which the resident has demonstrated competence.
3. Research and clinical improvement projects:
    Residents are expected to participate clinical improvement projects or clinical research activities during their residency. The resident needs to identify a faculty mentor for the project. The project needs to be approved by the residency director.

Rotation Evaluation

The residency consists of two clinical years with rotation through eight rotations. Successful completion of the rotation is based on the resident having an overall score of "**Good – Meet Expectation**" in specific goals of each rotation, which in general includes

- completion of all activities;

- an end-of-rotation oral exam; questioning during the end-of-rotation presentation may satisfy this requirement.

In addition to the individual module evaluation, a formal oral exam is conducted by the teaching faculty members at the end of each training year. The goal of the oral exam is to prepare the resident to sit for ABR oral exam.

On top of that, two additional requirements are needed through the whole training years as:

- to have an overall good performance in general professional interaction and ethics; and
- to attend didactic lectures, rounds (chart rounds, grand rounds), clinical conferences (morbidity and mortality, new patient conferences etc.).

Progression of each rotation in general requires increased work independence although always under mentors' supervision. The rotation mentor meets with each resident on a weekly basis. The program director meets with resident on a monthly basis to provide direction for further improvement.

Resident Log

Residents are required to keep your own activity log, which will be periodically reviewed by Program Director. The template of the activity log can be found in the departmental shared network drive.

Meeting with Program Director

The Program Director will meet with each resident every month to discuss the progress and program, review clinical and written examination performance results, log books, evaluations and discuss overall goals and career plans. Every quarter, an official meeting with program director will be scheduled. Meeting minutes will be documented and signed by both resident and program director. In addition, the Program Director's open door policy provides residents an opportunity to have informal discussions on any issue, including academic and administrative, at any time.

Evaluations of the Program and Faculty

The general issues of the residents, including clinical training/academic activities/administrative issues, of the residents are typically addressed during the daily interaction with the teaching faculty members and/or program director. The residents are provided feedback continuously regarding their progress, and solution to their concerns/issues.

Program director meets the residents at least on a monthly basis to make sure each resident's progress is on track. Formal quarterly meeting with the program director is also scheduled to document the progress, feedback and issues. Minutes are kept and signed by program director and residents.

In addition, chief resident(s) is (are) required to attend the semi-annual steering committee meeting, issues/concerns/comments can be addressed during the meeting with the steering committee. Physics residents are also provided anonymous evaluation of the program and the faculty members for each rotation. The evaluation is conducted by the program coordinator anonymously and the results are disclosed to the steering committee members. If any action is needed, action plan will be discussed during the steering committee meeting and will be reviewed in the consecutive meeting. The meeting minutes are reviewed by steering committee members and action for improvement will be conducted when needed.

The steering committee review the educational program on a semi-annual basis and take appropriate action to address improvements when needed. Minutes of steering committee review, including a summary of any actions, are recorded. In addition, a final mock oral exam is performed before a resident would graduate. The graduating resident is also asked to provide an exit evaluation of the program. The information collected will be used as the basis for the next steering committee to annually assess the quality of the education program.

Resident Evaluation by Faculty and Staff

A key means by which the resident's progress will be evaluated is the end-of-rotation presentations and written evaluation by the rotation mentor. The residents will also meet with the program director. The progress through the program will be discussed and rotation logs reviewed. The goal of these meetings is to ensure that the resident is progressing steadily and is on track to complete all the program requirements within the allotted time period.

If a resident is not meeting the training goals of the program training, a specific plan will be developed by the program director and steering committee to get the resident back on track. This could take the form of a written plan for near-term training goals or extra one-on-one mentoring by a senior physicist. If the resident fails a particular rotation, part or all of that rotation may be repeated at the discretion of the program director and steering committee. As with the medical residency, a failing resident may be removed from the program, but this is considered a last step. The Grievance and Due Process policy is outlined in the previous chapter. The residents are also encouraged to refer the COH ACGME policy for details.