Radiation Oncology
UNIVERSITY OF TORONTO

Medical Physics Residency Program Handbook

Updated: September 13, 2022

Statement of Acknowledgement of Traditional Land

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

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Glossary

UTDRO	University of Toronto Department of Radiation Oncology
PMH	Princess Margaret Cancer Centre, University Health Network
SOCC	Sunnybrook-Odette Cancer Centre, Sunnybrook Health Sciences Centre
PRPC	Physics Residency Program Committee
DRCC	R. S. McLaughlin Durham Regional Cancer Centre, Lakeridge Health
CFRCC	Carlo Fidani Regional Cancer Centre, Trillium Health Partners
SRCC	Stronach Regional Cancer Center, Southlake Regional Health Centre

Program Goals and Objectives

Goal

The goal of the University of Toronto Residency Physics Residency Program is to produce highly qualified and competent health professionals who combine a comprehensive understanding of clinical radiation physics and specific knowledge of radiation therapy and radiation oncology principles and practice with enhanced leadership, research and teaching skills to bring about significant advances in the practice of radiation medicine globally.

Objectives

The objectives of the Medical Physics Residency Program are:

1. **To prepare each resident for a future career as a Radiation Oncology Physicist.**

   During the program, the residents will become competent in all of the radiation oncology physics activities undertaken in an academic cancer centre. The residents will gain the technical knowledge and skills required for this career. This includes the ability to assess, develop, and implement new technologies in a safe, effective manner.

2. **To prepare residents to recognize, understand and address scientific and technical problems relevant to the practice of radiation oncology physics.**

   Advances in science and technology significantly impact the practice of radiation oncology physics. Critical assessment, problem-solving and research skills will be developed further throughout residency.

3. **To provide residents with additional competencies (outside of radiation oncology physics knowledge) to enable them to work effectively in the inter-professional healthcare environment.**

   Residents will work closely with radiation oncologists and radiation therapists to understand the role and practice of radiation oncology and radiation therapy in cancer management. Communication, scholarship, leadership, collaboration, professionalism and ethics will all be addressed.

1. Program Structure and Governance

Physics Residency Program Committee

Policy 1.1

Revision Date: February 14, 2013

1. The Residency program is governed by the Program Director and the Physics Residency Program Committee.

2. The PRPC is chaired by the Program Director (see Policy 1.2) and includes one physics resident, one radiation oncologist (Radiation Oncology residency program director or designate), one radiation therapist (with faculty appointment), the Program Registrar and the Associate Program Directors from PMH, SOCC, DRCC, SRCC, and CFRCC. The UTDRO Education Officer is a non-voting member of the PRPC.

3. Terms of Reference are located in Appendix A: Physics Residency Program Committee – Terms of Reference.

Program Director

Policy 1.2

Revision Date: October 27, 2022

1. The Program Director is appointed by the Executive Committee of the UTDRO from among the physics faculty in the UTDRO.
2. The Chair of Education in the UTDRO recommends a new or replacement Program Director to the Executive Committee of the UTDRO.
3. For purposes of the Physics Residency Program, the Program Director reports to the Vice–Chair, Academic programs, UTDRO.
4. The Program Director should meet the following criteria:
   - Must be certified by the American Board of Radiology, the Canadian College of Physicists in Medicine , or equivalent
   - Must have at least 5 years of full-time post-graduate experience in clinical Medical Physics
   - Must be a full time staff member of the radiation oncology (or radiation medicine) program and be involved in the practice of radiation oncology physics.

5. Responsibilities of the Program Director include:
   - Must contribute sufficient time to administer the training program and ensure adherence to guidelines and appropriate quality control of the program from beginning to end. This includes ensuring timely reporting of resident statistics, annual reports and other required information to CAMPEP.
   - Must be responsible administratively for the total training program in radiation oncology physics, and should participate in the instruction and supervision of physics residents.
   - Must arrange for the provision of adequate facilities, teaching staff, clinical resources and educational resources. Associate Program Directors at each site are responsible for coordinating staff locally to administer the program at each of the primary or affiliate sites.
   - Is responsible for administering the selection process for the medical physics residents and must ensure that the guidelines regarding the eligibility requirements and selection process are followed. This responsibility may be delegated to the Program Registrar, but ultimate responsibility lies with the Program Director.
   - Must ensure that the proper evaluation procedures are followed during the training program.
   - Must meet periodically with all residents to assess the resident's progress and minutes of the meeting shall be maintained. A copy of the minutes shall be provided to the resident.
   - To help fulfill the above responsibilities, the program director will conduct annual site visits to each of the clinical sites. The site visit will include a meeting with the local head of medical physics, the associate program director, local program faculty (including

rotation supervisors, mentors and research supervisors) and individual meetings with each of the residents. The meetings will be used to address programmatic information such as change in curriculum, updates in standards, logistical concerns, etc. as well as to discuss local implementation and the progress of local residents.

Program Faculty

Policy 1.3

Revision Date: February 8, 2022

1. Faculty from the UTDRO and staff physicists from PMH, SOCC, DRCC, SRCC, and CFRCC are involved in the Residency Program as associate program directors, course supervisors, lecturers, rotation supervisors and mentors. All staff physicists at PMH, SOCC, DRCC, SRCC, and CFRCC may participate, to some extent, in the program.
2. **Faculty** is selected based upon their clinical experience and expertise, teaching and supervisory ability and the quality and relevance of their research program.
3. There will be one **Associate Program Director** at each of the sites. The associate program director is responsible for overall management of the residency program at that site. This individual is selected by the hiring manager at each site, and must have a minimum of 5 years of clinical experience.
4. Each resident will have one **mentor** who is a certified staff physicist, and who will provide mentorship to the resident throughout the program. The advisor will meet on a regular basis with the resident and guide him/her through the program.
5. Each resident will have one **project supervisor** for his/her clinical development project.
6. Each didactic course will have one **course supervisor**. That supervisor may use other faculty as lecturers.
7. Each clinical rotation will have one **rotation supervisor**. That supervisor will have expertise in the material covered by the rotation.
8. For any other clinical projects throughout the course of residency, the resident will work with a faculty physicist.

Program Registrar

Policy 1.4

Revision Date: February 8, 2022

1. The Program will have a Program Registrar.

2. The Registrar will be a staff medical physicist at one of the five training sites and will be a faculty member in the UTDRO.

3. The Registrar will be selected from interested applicants by the Vice-Chair Education and the Program Director.

4. The Registrar will be responsible for organizing all applications to the Program and for reviewing all applications for completeness.

5. Together with the Program Director, the Registrar will decide upon eligibility of all applicants.

6. The Registrar will coordinate the review of eligible applications and the selection of candidates for interview with the Program Committee.

7. The Registrar will arrange the interviews and act as the main point of contact with applicants who have been selected for interview.

Admissions Committee

Policy 1.5

Revision Date: July 19, 2021

1. The Program will have an Admissions Committee.
2. Admissions Committee members are identified at least one month before candidates for residency are interviewed.
3. The Admissions Committee is chaired by the Program Director and consists of the site coordinators and/or the local heads of the hiring sites, and the Program Registrar. The Radiation Oncology member of the PRPC, or his/her delegate, also participates.
4. All components of an applicant's application must be submitted by the application deadline in order to be considered for a particular start date.
5. The Admissions Committee reviews the materials (i.e., CV, cover letter, transcripts, and letters of references) from each of the candidates selected for interview by the Program Director and the Program Registrar (see Policy 2.2).
6. The Admissions Committee attends the interviews and each member fills out the Candidte Evaluation Form (*the exact format of the form may vary due to variations in format dependent upon number of candidates, in person vs virtual interviews, etc.)*.
7. After all interviews have been completed, the Admissions Committee will identify any candidates that will not be eligible for ranking by any site.
    a) If the positions are being offered through the MedPhys Match, each site participating will submit their rankings, choosing from the eligible candidates, to the Program Director by the deadline identified (at least 3 days before the match rankings close).
    b) If the positions are being offered outside of the match (e.g. January start dates), candidates will submit their ranks, and each hiring site will rank the candidates and the program will match them to the clinical site according to Policy 2.1, Art. 4.
8. Immediately after letters of offer are accepted, the Admissions Committee is dissolved until the next round of interviews.

Chief Resident

Policy 1.6

Revision Date: July 16, 2021

1. The Program will have a Chief Physics Resident.
2. The Chief Physics Resident will be elected by the Physics Residency Program Committee, including the outgoing Chief Physics Resident for a one-year term. Applicants should have been in the program at time of application for a minimum of 6 months.
3. The chief resident's term will typically be one year in duration term will be from August 1 to July 31^{st}.
4. The resident should be a resident in good standing at the time of their application.
5. The Chief Physics Resident will serve as the resident representative on the Physics Residency Program Committee, which meets quarterly at minimum.
6. The Chief resident will serve as liaison between the residents and PRPC, bringing forward feedback from residents to the committee.
7. The Chief resident will serve as a liaison, when required, between the Program Education Officer and the rest of the residents.
8. The Chief resident will represent the physics residents on UTDRO committees, as appropriate, including the Education Committee and the TES-Alumni Committee.

2. Administration

Enrollment and Recruitment

Policy 2.1

Revision Date: February 8, 2022

1. The number of residency positions will be determined on a yearly basis, based on available funding.
2. Residency positions will be advertised locally and nationally, if necessary.
3. Funded residency positions will be available at all sites, provided the primary sites have residents to enable delivery of all required components of the residency program.
4. The hiring/placement of a residency candidate at one of the five training sites is outlined in Policy 1.5 as a responsibility of the Admissions Committee. In the case that the round of hiring is not part of the MedPhys Match, the matching process will account for the preferences of both the candidates (first) and the training sites. Candidates will rank the sites and hiring sites will rank the candidates.

Admissions

Policy 2.2

Revision Date: February 8, 2022

1. The Admission Process must be in accordance with current CAMPEP policies.

2. Admission to the Physics Residency Program follows a careful review of credentials, an interview process and approval by the Admissions Committee.

3. The number of positions available at the beginning of each fall or winter academic terms will be based on available funding. Applications will be accepted throughout the year; however firm deadlines for applications are posted on the program website for both the September and January start dates if positions are available.

4. Candidates must have a M.Sc. (thesis based) in Radiation Oncology Physics (CAMPEP accredited graduate program), or a Ph.D. in a CAMPEP accredited graduate program. Alternatively, non-CAMPEP Ph.D. graduates (with a PhD in Medical Physics or related field) must have completed a CAMPEP accredited certificate program, or have had course

equivalency verified by CAMPEP prior to application. Strong preference will be given to candidates with a Ph.D. from a CAMPEP accredited program.

5. Candidates submit an application for admission to the Program Director or to the Program Registrar (see Policy 1.4). Required documents are sent to the Program Registrar or Program Coordinator

6. A **cover letter** summarizing expertise and achievements, updated Curriculum Vitae (CV) including a record of publications and the **names of 3 professional references** must be included in the application package. Dependent on application timelines, letters may be requested at the same time as the application, submitted directly to the program. **Official transcripts** of undergraduate and graduate course work are also required. Applications will not be processed until **ALL** required documents have been received.

7. The Program Registrar and Program Director will be responsible for reviewing applicants' suitability.

8. The full application packages of selected candidates will be reviewed by the Admissions Committee. If letters are not requested at the time of the application, prior to contacting the references, permission to do so must be obtained from the candidate.

9. Successful candidates will be invited to Toronto for an interview. Candidates who are unable to travel to Toronto will be offered an interview via teleconference.

10. The interview process will include a brief formal presentation followed by an interview before the Admissions Committee. The members of the admissions committee will fill out the evaluation form in as stated in Policy 1.5.

11. The Admissions Committee will rank suitable candidates, and all candidates will rank their preferences with respect to the hiring sites. The Admissions Committee will match them to the clinical site according to Policy 2.1, Art. 4.

12. Applicants will be provided with information needed to make appropriate decisions regarding offer acceptance or to guide their ranking preference for hiring sites, including requirements for registration at PGME and salary and benefits offered by each of the hiring sites. This is provided immediately after interviews, prior to any deadlines for ranking or decision making.

13. An offer of admission will be made by the University of Toronto, Department of Radiation Oncology Program, followed by offers of employment drafted by the hiring clinical site in accordance with the hiring policies of each participating clinical site and their host institution.

Finances

Policy 2.3

Revision Date: April 24, 2017

1. Residents are employed at one of the five clinical sites, PMH, SOCC, DRCC, SRCC, or CFRCC. Salary and benefits are set by each institution.

2. The resident has access to funding for conference travel to <u>at least</u> one national or international conference. Approval and expenditure of these funds is based upon the policies and procedures of the institution at which the resident is employed.

Facilities

Policy 2.4

Revision Date: February 8, 2022

1. Facilities for the Physics Residency Program are provided by PMH, SOCC, DRCC, SRCC, or CFRCC.
2. Each resident has a desk and work area in the Medical (or Radiation) Physics Department. Residents will be supplied a desk top computer with access to the local area network and the internet.
3. The Department of Medical Physics (SOCC) and the Department of Radiation Physics (PMH) each have a small library with holdings mainly of radiation oncology physics related textbooks and reports. SOCC, PMH, DRCC and CFRCC each have their own library which contains medically oriented texts and journals. Physics residents can also access the University of Toronto library system.
4. PMH, SOCC, DRCC, SRCC, and CFRCC are fully equipped tertiary cancer treatment facilities. Equipment and infrastructure supports clinical programs in external beam radiotherapy

(including 3DCRT, IMRT, VMAT, IGRT, SBRT, SRS, TBI, orthovoltage) and brachytherapy (LDR and HDR).

5. Both the primary and affiliate sites have an electronics shop with the full range of test and diagnostic equipment and a fully equipped machine shop.
6. All sites have dedicated information technology (IT support) through the host institution or within the Radiation Medicine program itself.

Relationship to Other Programs

Policy 2.5

Revision Date: February 8, 2022

1. The Physics Residency Program is a program in the UTDRO, in the Faculty of Medicine of the University of Toronto.
2. The Program is operated within the Radiation Programs at all sites. At each centre, the Department of Medical Physics), together with the Departments of Radiation Oncology and Radiation Therapy constitute the Radiation Treatment Program (Radiation Medicine Program at PMH).
3. Many staff within the Radiation Treatment Program are appointed to Research Institutes at SOCC and PMH or affiliated hospitals.
4. Members of the medical physics and radiation oncology groups are also members of the Department of Radiation Oncology, the Department of Medical Biophysics at the University of Toronto and many other university departments and hospital research institutes.
5. The Departments of Radiation Oncology Physics encompasses not only the staff physicists but also electronics, mechanical and information technology professionals, physics assistants/associates and residents.
6. The Radiation Oncology Residency Program is accredited by the Royal College of Physicians and Surgeons of Canada. Radiation Oncology Physics and Radiation Oncology Residents participate jointly in several curricular activities.
7. The Department of Radiation Oncology offers a training program in medical radiation technology through The Michener Institute for Applied Health Sciences and the University of Toronto. Many of these students in the radiation therapy stream have their clinical rotations at either SOCC or PMH. Staff medical physicists and radiation oncologists are also lecturers in this program.

Program Resources

Policy 2.6

Revision Date: February 14, 2013

1. The Physics Residency Program receives support from UTDRO, PMH, SOCC, DRCC, SRCC, and CFRCC.

2. The two main clinical sites for the program are the SOCC and PMH; the affiliate clinical sites are the DRCC, SRCC, and CFRCC.

3. Administrative and educational resources for this program are provided by the UTDRO.

4. Operational resources for the program are supplied by the main and affiliated sites.

5. Salary support for residents is supplied through the operating budgets of the main and affiliated sites.

Orientation

Policy 2.7

Revision Date: February 8, 2022

1. Incoming residents will receive orientation to both their training site and the program.
2. The Program Director will deliver orientation to the program, including program policies and requirements, including professional conduct.
3. The Associate Program Director will lead orientation to the training site, including coordinating required meetings and training. This includes orientation to all site-specific policies and completion of mandatory training requirements.

Privacy

Policy 2.8

Revision Date: February 14, 2013

1. All documents pertaining to the program will be maintained in the administrative offices of the University of Toronto Department of Radiation Oncology.

2. Documents in use (e.g. Applications) may also be kept temporarily in the office of the Program Director.

3. The privacy of all information concerning residents, resident performance and instructors' performance is a priority of the Physics Residency Program.

4. All written and electronic information concerning residents, and resident and instructor performance will have access restricted to the Program Director and those designated by the Program Director.

5. Minutes of the meetings of the Physics Residency Program Committee will not be circulated beyond the membership of the committee.

6. Applications will be kept on file for a maximum of six months.

Safety

Policy 2.8

Revision Date: February 8, 2022

1. The safety of patients, staff, residents and the public is a priority at all sites.
2. Resident orientation includes training from the Radiation Safety Officer or appropriate designate.
3. Residents will be required to take WHMIS training (Workplace Hazardous Materials Information System) and any required annual mandatory training for their local sites.
4. Residents will be required to fulfil requirements for occupational health and safety at their local site.
5. Residents will need to complete any mandatory training required by the other training sites if they need to travel to another site for a clinical rotation. This training can be facilitated through the Program Coordinator in conjunction with the training site.

Trainee Initiated Leave

Policy 2.9

Revision Date: February 8, 2022

1. Medical Physics Residents may initiate a leave for specific reasons, including, but not limited to, maternity, parental, medical or caregiver leave.
2. The leave will be reported in writing locally based on policies and rules of the hiring site. This should include communication to the Associate Program Director at the earliest possible date. This also facilitates other reporting and paperwork that may be required for the hiring site. The communication should include timelines and conditions for return to the program.
3. Written notification will also be made to the Program Coordinator to facilitate changes in registration status with PGME.
4. Any total leave in a year longer than 40 days (not including vacation and academic/conference time) will automatically stop the clock on the total time spent in the residency program and will result in the time of the leave to be added on to the end of residency.
5. After completion of the leave of absence, the resident will meet with the Program Director and relevant Associate Program Director to discuss adjustments in schedule or curriculum to ensure the resident meets all program requirements.
6. Changes in duration of residency may be required for leaves less than 40 days if the resident does not meet all program requirements for completion of residency.

3. Program Requirements

Curriculum Design and Contents

Policy 3.1

Revision Date: February 8, 2022

The Residency Program is designed around six key components to facilitate the goals of the program, incorporating a spiral curricular design, clinical experience and explicit inclusion of professional competencies (including communication, collaboration and leadership):

1. Clinical Rotations
2. Major Clinical Development Project
3. Didactic Clinical Physics Courses/Sessions
4. Tutorial/Evaluation Sessions
5. Clinical Activities
6. Continuing Education

Clinical Rotations

Residents will complete a series of clinical rotations. Details of all of the rotations are contained in Appendix B, including the full descriptions, objectives and reference lists. A rotation supervisor is responsible for resident progress through a rotation and for assessment of their progress in the rotation. At the beginning of a rotation, a resident will meet with the rotation supervisor to review the rotation objectives, expectations and timelines. The rotation supervisor will evaluate the resident at the end of the rotation and provide feedback. The evaluation schemes are described in the detailed rotation descriptions.

A comprehensive list of clinical areas, in which the resident is expected to be competent in, is contained in the Rotation Master List and Signature Sheet, and is also used to track resident progress. It is not necessary to complete the competencies in the order in which they appear listed under each clinical rotation. This allows physicists other than the rotation supervisor to check off competencies as they are demonstrated. At the end of each rotation all competencies listed under that rotation should be signed as completed, and feedback is passed on to the Rotation supervisor as required to complete the Rotation Evaluation. Many of the rotations will have clinical activities associated with the rotations such as plan review, commissioning or QC activities.

The clinical rotations are:

1. Equipment: Dose Measurement Tools/Systems
2. Equipment: Imaging Systems
3. Equipment: External Beam Radiation Therapy
4. Theories and Principles of Treatment Planning
5. Clinical Treatment Planning

6. Quality Management
7. Radiation Safety
8. Brachytherapy

Major Clinical Development Project

The resident will complete a longitudinal two-year clinical development project during the course of their residency. The project requires the resident to conduct an independent clinical project in radiation medicine under the direct supervision of a project supervisor. The project supervisor will provide direction and support throughout the research and development process. The project supervisor will ensure a suitable balance of time between the project and clinical commitments is maintained. At the conclusion of the project, the resident will have produced a proposal, a scientific presentation and, if possible, a scientific paper. In addition, the resident will be expected to submit a minimum of one acceptable abstract to the Department of Radiation Oncology Annual Research Day. The project is also presented as part of their final exam.

Didactic Clinical Physics Courses/Education Sessions

There are two mandatory courses:

1) Case-Based Applied Physics Course

This is a case-based course taken in 2nd Year, alongside PGY2 Radiation Oncology Residents. There is an oral exam at the end of the course that the resident must successfully complete.

2) CanMEDs in Clinical Practice

Residents attend several different interactive lectures and workshops throughout the course of their residency that address important competencies essential to the holistic development of health professionals as outlined in the CanMEDS framework. Residents will develop a framework with which to approach professional multidisciplinary practice. The resident will be challenged to reflect on their professional culture, appreciate and develop teaching skills, understand and role model professional behaviors, not only in the conduct of ethical science but also in interpersonal interactions with colleagues and staff. At least one session is focused on professionalism and ethics in Medical Physics. Active participation and attendance is required.

Two additional short courses are recommended in the first year of the program:

1) Clinical and Experimental Radiobiology
   This 5 day course is offered during a single week, once a year, through the UTDRO. This course provides a comprehensive overview of radiation biology from world-renowned faculty, with a particular emphasis on aspects of direct relevance to the practice of radiation oncology. It addresses the molecular and cellular responses to radiation-induced damage that influence cell death in both tumors and normal tissues. Quantitation of radiation effects and the underlying biological basis for fractionation of radiotherapy and dose- response relationships

in the clinic are covered in depth. The biological basis for current approaches to improve radiotherapy will be described including novel fractionation schemes, retreatment issues, targeting hypoxia, biological modifiers, immunotherapy and combined radiotherapy/chemotherapy. No registration fees for UTDRO physics residents.

2) Accelerator Technology Education Course (ATEC)
A four day course including lectures and simulation labs to understand the components of a linac and how they work together to generate a clinical treatment beam. Quality and safety concepts related to linear accelerator technology are also addressed. This course is offered through the Accelerated Education Program at the Radiation Medicine Program at Princess Margaret Cancer Centre and residents can register free of charge.

Tutorial/Evaluation Sessions

The tutorial and evaluation sessions are used for evaluating the progress of each resident and focus on the resident's ability to orally communicate their knowledge on a specific topic. The topics do overlap with clinical rotations, but the timing of the tutorials is not designed to consistently overlap in time with the clinical rotations. This is done to include a spiral curriculum concept into the residency program, to help the residents keep concepts fresh, and to also have a chance to incorporate new knowledge they gain through other rotations into their medical physics knowledge and competencies.

The sessions are conducted using a pre-set list of topics, which covers most of the residency program syllabus, with an emphasis on the practical clinical aspects of the topic. Residents come prepared to answer questions on the defined topic. Questions are posed by a maximum of 3 staff medical physicists. These sessions are conducted by physicists at each local site. Details of the tutorial/evaluation session are outlined in Appendix C: Physics Resident Tutorial/Evaluation Sessions. The evaluation form (included in the appendix) for the tutorial/evaluation sessions is completed for each tutorial by the faculty members and also reviewed and signed by the resident. These sessions are a tool for frequent feedback to the resident. Pass mark is 70%.

The Tutorial/Evaluation sessions will also help to prepare the resident for the Year 1 and the UTDRO Final Examination held at the end of the program.

Continuing Education

Residents are expected to participate in continuing education program of the Radiation Program at their clinical site (or other programs as available) to help create professional habits that will serve them well throughout their career. Attendance may include Radiation Oncology Rounds, General Rounds, Physics rounds or other lectures of relevance to their profession.

This includes expectations to attend and participate in the Medical Physics Residency Journal Club (Appendix D).

Residents are also supported to attend at least one national/international conference during their residency program.

The resident should keep a record of session attendance in their log book.

Clinical Activities

Residents will participate in many clinical activities as part of their clinical rotations. This includes, once they are able to perform the tests independently, responsibility for QC tasks for linacs and imaging equipment as assigned at their local training site.

After completion of their Year 1 exam, residents will also be expected to participate in chart checks as outlined in Policy 3.7.

In addition, residents will be engaged in clinical commissioning activities as they occur in the clinic, including but not limited to linear accelerators, treatment planning systems, brachytherapy equipment, and implementation of new clinical techniques. Level of participation and responsibility will be dependent upon their level of experience and progress in the program, and will be under the supervision of a medical physics faculty member as appropriate.

Requirements for Satisfactory Program Completion

Policy 3.2

Revision Date: February 8, 2022

1. Residents must successfully complete all clinical rotations. At the conclusion of the residency, all of the items listed in *Appendix E: Physics Resident Rotation Master List and Signature Sheet* must be completed and the resident will received successful evaluations (as assessed by rotation supervisors) as documented in the rotation descriptions.

2. The resident must pass each of the topics of the tutorial/evaluation sessions. A pass mark is considered to be at least 70%.

3. The residents must successfully complete the Year 1 Exam (Appendix F).

4. The resident must complete the major clinical development project.

5. The resident must successfully complete the mandatory courses.

6. Completion of the above items will be verified by the Program Director prior to the final residency exam.

7. The resident must pass the UTDRO Final Examination, details for which are included in Appendix G.

Evaluation of Resident Progress During the Program

Policy 3.3

Revision Date: February 8, 2022

1. Rotation Supervisors are expected to assess the resident for each rotation using the rotation evaluation forms. They will also track resident achievements of competencies through the Rotation Master List and Signature Sheet. For some rotations, this may include both formative and summative assessments. Rotation supervisors are expected to discuss the evaluations with the residents. Rotation evaluation forms will also be used to provide the resident feedback related to the CanMEDS roles, and their skills in those areas.

2. Residents will be evaluated at the end of their clinical development project and complete a presentation as a component of the Year 2 final exam.
3. All physics resident tutorial/evaluations are formally evaluated and resident progress is tracked. All unsuccessful tutorial results will be reviewed by the Associate Program Director. If a resident is unsuccessful in a tutorial the Associate Program Director and possibly the mentor will meet with the faculty evaluator for feedback and help to devise a study plan, if needed, to address any deficiencies in knowledge or competencies. If there are 3 unsuccessful evaluations in a year, the Associate Program Director will notify the Program Director and report at PRPC.
4. There is a summative evaluation of the Applied Physics Course. If a resident is unsuccessful in this evaluation, a re-evaluation is completed. An independent faculty observer will participate in the re-evaluation in order to gather feedback that can be provided to the resident and can assist in developing a remediation plan if required or assist in resident preparation for the retake and the final UTDRO exam. Participation throughout the course is also assessed by the course supervisors.
5. Formal evaluations are reviewed and signed off by the resident. Any original forms are kept in the resident file, copies are available for the resident.
6. Resident progress and their evaluation results are monitored by Associate Program Directors and presented to the Physics Residency Program Committee quarterly (at minimum). As part of this monitoring, the Associate Program Directors will routinely review the residents' log books. The Associate Program Director will discuss with the Program Director any concerns with resident progress in between meetings as well.
7. The program director visits every clinical site once a year to provide residents with formative feedback. The director also discusses the progress of the local resident(s) separately with the resident(s) and the local faculty. Residents are offered explicitly an opportunity to provide feedback to the program during these formative feedback sessions. The evaluation with the resident is recorded in Formative Feedback form.
8. A Year 1 Oral Examination (Appendix F) is used to assess resident progress at the mid-way point of their residency and residents must successfully pass this exam. Details of the exam format are included in the Appendix, including the steps that will occur if a resident happens to fail the exam. Explicit feedback to the resident on their strengths and weaknesses is an important part of the exam debrief.
9. The final assessment of residency completion is the successful completion at the end of the second year of the UTDRO Final Examination. This exam is described in Appendix G.

Evaluation of Program Curriculum

Policy 3.4

Revision Date: February 8, 2022

The Residency Program curriculum will be evaluated on a regular basis.

1. The maintenance of the standards and quality of the curriculum for the Physics Residency Program will be reviewed and discussed at the PRPC.
2. At least one meeting per year will be fully dedicated to curriculum and program review.
3. The review will consider resident feedback which is collected as described in Policy 3.4
4. The following items will be considered in the review process:
   - Continued consistency with CAMPEP requirements. Other guidance reports regarding curriculum (e.g. AAPM Report No. 249 (or any subsequent updates)) will also be considered.
   - The review should also consider changes to software/hardware/infrastructure or practice at the training sites.
   - The major components of the program will be reviewed (rotations, tutorial evaluations, courses and clinical development project).
5. To facilitate this evaluation, rotation supervisors, research supervisors or other faculty will be engaged in the review as needed, by requesting review of specific curriculum components one month prior to the PRPC meeting, and submission of any proposed changes prior to the meeting.
6. The PRPC will recommend improvements to the Program based on feedback received and logistical/practical considerations.

Resident's Evaluation of Program

Policy 3.5

Revision Date: February 8, 2022

The Physics Residency Program will be evaluated on a regular basis by the methods described below. The goal of the feedback is to improve the learning experience for residents, to evaluate specific components of the program curriculum and maintain the standard and quality of the program.

1. Clinical Rotation Evaluations
   Individual evaluations will be submitted anonymously Program Coordinator and a summary of the results will be reviewed by the Program Residency Committee and the rotation supervisor.

2. Course Evaluations
   Residents are provided opportunity to complete evaluation forms for the courses they take part in as a resident. Courses that are offered to physics residents that are coordinated by other affiliated groups are evaluated using standard templates. Residents taking the course are asked to complete anonymous evaluations electronically evaluating all elements of the course including overall satisfaction, teaching format, and individual speaker teaching effectiveness. Course directors/coordinators liaise with Residency Program Director to ensure residents' needs are being met where appropriate. Residents may also be asked to join planning committees for some courses where they can also provide feedback and inform quality improvement of the course.

3. Faculty Evaluations
   Faculty members may be evaluated by residents in the context of didactic teaching, rotation supervision or ad-hoc clinical teaching. This feedback is to assist the faculty in evaluating their teaching effectiveness and to provide the Program Director with information for the faculty member's annual performance appraisal. Individual evaluations will be submitted anonymously either via PGME mechanisms (rotations) or through UTDRO for courses or other ad-hoc teaching. A summary of the results will be reviewed by the Program Director and the faculty members. Supervisor evaluations are NOT reviewed by the Residency Committee.

4. Summative Feedback
   The program director visits every clinical site once a year and discusses the progress of the local resident(s) separately with the resident(s) and the local faculty. Residents are offered explicitly an opportunity to provide feedback to the program during these summative feedback sessions.

5. Anonymous Program Evaluation
   The program evaluation is conducted after completion of the program. It is designed to provide residents with the opportunity to provide constructive feedback about the Program, After completion of residency, the Program Coordinator will send an electronic link for the

survey to the residents, enabling anonymous completion. Results from the survey are compiled by the Program Coordinator and reviewed by the PRPC

6. Resident Feedback at PRPC Meetings
   The Chief Resident also serves as a liaison between the residents and the PRPC. The Chief Resident will amalgamate feedback and present it anonymously at PRPC meetings for discussion.

Clinical Rotations

Policy 3.6

Revision Date: April 24, 2017

1. The site coordinator will assign each resident a rotation supervisor for the period of the clinical rotation. The rotation supervisor is selected based on the relevance of their own area of responsibilities and expertise to a specific rotation.
2. At the beginning of a rotation the supervisor will provide an orientation to the rotation, including a review of rotation objectives, identify competencies that must be demonstrated at the end of the rotation, and describe any summative evaluation that will be completed as part of the rotation. Timelines will also be set.
3. The rotation supervisor is expected to meet regularly with the resident, as necessary, to review progress on the rotation objectives.
4. The residents' performance is assessed for each clinical rotation by the rotation supervisor using the appropriate evaluation form and the rotation supervisor, or designates, will sign off on items in the Master Rotation and Signature List.
5. Achievement of some competencies may also be assessed in tutorial evaluations to reinforce learning.
6. The rotation supervisor will make every effort to consider the resident's commitments to their clinical development, general clinical duties such as Quality Control, and didactic course work in establishing timelines. A
7. Addition of clinical activities not included in the rotation description should be discussed between the Rotation Supervisor and Associate Program Director before any additional clinical opportunities are presented to the resident. The Associate Program Director will consider the request based on resident progress in the residency and resident's current workload. If appropriate for consideration, the Associate Program Director will discuss with the resident directly. If the resident agrees to the extra component of the rotation, the resident will discuss details with the resident.
8. If the evaluation form is not in electronic format, records for each resident will be maintained locally at each clinical site and then filed electronically on the file sharing system at UTDRO.
9. If a resident does not successfully complete a rotation, the Associate Program Director will notify the Program Director for next steps.

Plan Review

Policy 3.7

Revision Date: April 24, 2017

1. Physics residents are expected to participate in the review of published treatment plans, once they meet the qualifications listed in Art. 2.
2. Qualifications:
   - Must have passed the Year 1 exam.
   - Prior to independently reviewing treatment plans for a specific anatomical site, Physics Residents must have completed the corresponding clinical rotation to the satisfaction of the rotation supervisor.
3. Documentation: All plan reviews need to be documented by the qualified resident. The appropriate documentation format will be defined by the local site. Residents need to have their reviews signed off by faculty.
4. Expected workload: Qualified residents are expected to review a minimum of 50 plans in their second year of residency

Clinical Development Project

Policy 3.8

Revision Date: April 24, 2017

1. During the first month of residency, the resident will meet with the Associate Program Director or Program Director to discuss the general requirements for the Clinical Development Project. The resident will also meet with several staff medical physicists and other radiation medicine staff to discuss potential clinical development projects. At the end of three months it is expected that the resident and course coordinator will together identify a project (that addresses an area of current interest to the local Radiation Program) for the resident and appoint a project supervisor.

2. After identifying the project and the supervisor, residents are required to complete and submit a Clinical Development Project Plan within the first four months of the Program. The project plan and description will be approved by the project supervisor and the Associate Program Director.

3. The resident must present their clinical project at UTDRO research day. They are also encouraged to submit the project to a conference and consider a manuscript if possible. They are also encouraged to present their work at Physics Rounds.

4. The resident will submit a final project abstract to the Program Director prior to their Year 2 Exam and prepare a short presentation of their work and be prepared to defend questions on their work as part of the final exam.

Continuing Education

Policy 3.9

Revision Date: April 24, 2017

1. Residents are expected to participate in the continuing education program of the Radiation Program at their clinical site. Residents are expected to attend Radiation Oncology Rounds, General Rounds, Physics Rounds in addition to any lectures of relevance to their profession. In particular it is required that residents attend 75% of all radiation oncology rounds, multi-disciplinary plan review rounds during clinical treatment planning rotations, and other academic rounds over the course of their program.

2. In addition, the resident will be expected to make a minimum of one presentation at the Department of Radiation Oncology Research Day.

3. The resident is required to keep a record of attendance of these sessions in their daily log.

4. Residents are expected to teach medical physics to physician residents, graduate students, technologist and other allied health professionals during the applied physics tutorials, physics rounds and during the research day.

5. Residents will gain experience with teaching other radiation program professional staff during the applied physics tutorials and also at their formal presentations at physics rounds and the research day, Other opportunities for teaching may arise, and residents are encouraged to be involved, if they are in good academic standing, and it is discussed with their mentor and Associate Program Director.

Expectations of the Resident

Policy 3.10

Revision Date: April 24, 2017

1. Residents are expected to conduct themselves in accordance with the standards set by their training/hiring site and to seek clarification whenever necessary.
2. Residents are expected to complete and maintain their registration with the University of Toronto throughout their residency program.
3. Residents will adhere to the applicable dress code.
4. Residents will inform the Associate Program Director of any absences (illness or otherwise).
5. Residents will be punctual and prepared for all scheduled clinical and educational activities and meeting.
6. Residents will record their activities in a daily log, in a format agreeable to their Associate Program Director.
7. Residents will complete all clinical rotations and projects to the highest standards and on time.
8. Residents will report unresolved differences of opinion to the Program Director.
9. Residents will wear a personal identification tag and a personnel radiation monitor when working in clinical areas, as required by any local policies.
10. Residents will leave the personnel radiation monitor in the appropriate location in their department at the end of the day, as determined by their own training site. They will follow local procedures if their identification tag or personnel radiation monitor becomes lost or damaged.
11. Non-compliance with the above expectations will result in performance counseling sessions with the Program Director.

Expectations of Associate Program Directors, Rotation Supervisors and Mentors

Policy 3.11

Revision Date: April 24, 2017

1. The Associate Program Director for a training site is expected to:
   a. Coordinate the scheduling of rotations, tutorials and evaluations that occur at their own training site. Coordinate rotations to be taken at other sites through the Program Director and other site coordinators, or help coordinate rotations that will be taken at their site by other residents.
   b. Actively participate in the Physics Residency Program Committee, Admissions Committee and Examining Committee as required.
   c. Be available to answer the resident's questions regarding the residency and the residency syllabus.
   d. Monitor the resident's progress throughout the residency and offer suggestions for improvement, where necessary to the resident.
   e. Prepare any necessary reports to document the resident's progress. This includes reports to the Physics Residency Program Committee on a quarterly basis.
   f. Maintain a record of meetings with residents.
   g. Inform the Program Director of residents "at risk" including recommendations for action (where requested). Creating and coordinating remedial action plans, in consultation with the Rotation Coordinator and the resident when a resident is identified for being "at risk."
   h. Implement recommendations of the Physics Residency Program Committee.
   i. Identify residents that are eligible for the final Year 2 exam according to Program Policy and Procedures.

2. A faculty member who agrees to be a **Mentor** is expected to:
    a. Meet regularly (a minimum of once per month) with the resident.
    b. Be available to answer the resident's questions regarding the residency and the residency syllabus.
    c. Support the resident with guidance about residency and the transition to clinical practice.
    d. Be aware of the resident's progress throughout the residency and offer suggestions for improvement, where necessary to the resident.
    e. The mentor is not involved in scheduling of resident's activities or rotations. No assessment of the resident is completed by a physicist within their role of mentor.
    f. Notify the Associate Program Director of any concerns that the resident asks the mentor to bring forward.
    g. Participate, when requested, in any remedial action plans created for residents "at risk".

3. A faculty member who agrees to be a **Project Supervisor** is expected to:
    a. Meet regularly (a minimum of every 1 month) with the resident.
    b. Provide guidance on project development and execution and oversee progress to ensure resident can meet timelines with respect to ensuring (at minimum) that the resident will have a submission for UTDRO Research Day.
    c. Be available to review reports or work on the project in a timely manner.
    d. Provide the resident with formative feedback on their performance throughout the project.
    e. Notify the Associate Program Director of any resident-related issues.
    f. Implement recommendations of the Physics Residency Program Committee.

4. A faculty member who agrees to be a **Rotation Supervisor** is expected to:
    a. Meet regularly with the resident throughout the rotation. The frequency is dependent upon the rotation length (more frequent for shorter duration).
    b. Oversee the daily activities of the residents in the rotation (no more than two residents per supervisor per rotation)
    c. Schedule the clinical rotation for the residents accordingly
    d. Provide supervision to the resident for all clinical tasks or identify appropriate additional faculty to assist.
    e. Ensure the resident is provided the opportunity to complete all the objectives of the clinical rotation
    f. Provide the resident with formative feedback on their performance throughout the rotation
    g. Complete and submit any and all evaluations
    h. Notify the Associate Program Director of any resident-related issues
    i. Inform the Associate Program Director of residents "at risk" including recommendations for action (where requested). Creating and coordinate remedial action plans, in consultation with the Associate Program Director and/or Program Director and the resident when a resident is identified for being "at risk."

j. Implement recommendations of the Physics Residency Program Committee.
k. Schedule any general sessions for the residents accordingly.
l. Review the residents' final evaluation with them.

Academic Standing

Policy 3.12

Revision Date: April 24, 2017

Good Academic Standing

To be in good academic standing the resident must:

1. Maintain registration with UofT Post Graduate Medical Education.
2. Maintain a full rotation/workload.
3. Attend all required sessions and fulfills clinical responsibilities as defined by local Associate Program Director.
4. Achieve a satisfactory performance in all clinical rotations.
5. Achieve a satisfactory performance in mandatory courses.
6. Achieves a satisfactory performance level in tutorials/evaluations sessions.

Probation and/or Remediation

A resident who fails to remain in good academic standing may be subject to a probationary period or remediation.

Probation

Probation is a period of education during which a student who is experiencing academic difficulties has an opportunity to demonstrate that they have the knowledge, skill and professional behaviours to successfully complete the Program.

Probation implies the possibility of dismissal from the Program if adequate improvement in performance is not identified by the end of the probationary period.

Remediation

Remediation is a formal program of individualized education aimed at assisting a student who is in academic difficulty. This does not refer to the assistance that is usually provided within the Program (e.g. within a course, rotation, or project) to help students who are having minor difficulties.

Remediation with Probation

Remediation with probation is a formal program of individualized education aimed at assisting a student in academic difficulty and also involves the possibility of refusal of promotion or of dismissal from the program if the student is unable or unwilling to meet the required standards of performance by the end of the probationary period.

Withdrawal from the Program

A resident who wishes to withdraw from the Medical Physics Residency Program must direct their request to the Program Coordinator and meet with the Program Director. An exit interview will be arranged.

Program Extension

A resident who is currently maintaining good standing and making progress toward completing program requirements, but is unable to complete the program requirements within the allocated time period, may be granted a program extension. Program extensions are granted by the Physics Residency Program Committee. Program extensions will be considered when delays in program completion are caused by compelling academic or medical reasons. The maximum program extension is 1 year. The continuation of salary is not guaranteed for the duration of the extension, but is at the discretion of the host site. The host site is responsible for continuing to provide the same clinical training environment and opportunities for the duration of the extension.

Program Initiated Temporary Leave

In the instance where a situation involving the resident arises requiring the program to make a rapid decision regarding course of action and where there is reason to believe that the resident, patients or the faculty are in danger, the resident will be temporarily removed from the learning environment. This temporary leave will be for a maximum of 5 days pending a final decision from the Physics Residency Program Committee.

Withdrawal and Dismissal

The resident will be required to withdraw from the program if they:

1. do not meet stated academic standing requirements after probationary period;
2. have a repeat failure in any clinical physics rotations;
3. fail the 2nd full attempt at the final exam
4. are engaged in resident misconduct
5. do not fulfill program requirements within 3 years

Dismissal

In addition to academic failure, there are several acts that may result in termination of the resident from the program. These are outlined in the Resident Misconduct section below.

Resident Misconduct

1. The residents' professional activities will be characterized by honesty, integrity conscientiousness and reliability.
2. The resident will display skill at communicating and interacting appropriately with patients, families and colleagues, irrespective of race, gender, disability, political ideology, sexual orientation or religion.
3. The resident will demonstrate:
    a. The ability to work harmoniously with all members of the team
    b. Respect for the confidentiality of all patient information (see Statement on Protection of Health Information)
    c. Professional independence, avoiding any compromise of professional integrity or conflict of interest
    d. Understanding of the appropriate requirements for involvement of clients and their families in research
    e. Recognition of the importance of self-assessment and continuing education

The UTDRO Physics Residency Program prohibits resident misconduct which includes, but is not limited to:

1. Obtaining or providing, without authorization , questions or answers relating to any examination or test prior to the time of the examination or test,
2. Obtaining or providing without authorization, resident test scores, evaluation results, or any confidential information not provided directly to the resident,
3. Plagiarizing, that is appropriating the work of another in part or whole and passing this work as the product of one's own mind or manual skill,
4. Failure to fully participate in scheduled rosters and / or educational activities
5. Inappropriate professional misconduct that would violate the Canadian Organization of Medical Physicists (COMP) professional Code or Ethics or the hospital Code of Ethics, and
6. Violation of the criminal code
7. Breach of confidentiality
8. Non-compliance with patient Privacy Act of Ontario
9. Being under the influence of alcohol or drugs
10. Unsafe practice / threatening behaviour which can be reasonably interpreted to jeopardize the safety to fellow residents, staff and / or patients
11. Acts of willful damage to the property of the hospital

Any acts of alleged misconduct will be referred to the PRPC for review.

The PRPC may impose disciplinary sanctions up to and including the dismissal of a resident from the program or may impose any conditions which must be met in order for the resident to continue in the program.

Performance Counseling

Policy 3.13

Revision Date: April 24, 2017

1. At least each semester the resident will meet with the Associate Program Director to review and discuss progress. Meeting will be minuted.

2. In addition, if at any time, it is recognized that a resident is not meeting the technical, clinical, academic, ethical or professional requirements of the program, the Associate Program Director will meet with the resident for performance counseling**.**
    a. Program Requirements will be reviewed and discussed
    b. Resident will be given an opportunity to share their concerns
    c. Written summary of the meeting will be provided to both the resident and to the Program Director using the Program Counseling Record
    d. The resident will be reminded of the availability of wellness and other resources from the University of Toronto, Postgraduate Medical Education

3. The resident's performance and supporting documentation will be reviewed and discussed by the PRPC. This discussion will include a determination if any changes are recommended to the resident's status as per Policy 3.12 and to determine next steps.

4. While the Program will do everything possible to assist the resident in areas requiring improvement, the resident is ultimately responsible for their education and should therefore take an active role in continuous self-evaluation; and seeking out assistance when required.

Appeals

Policy 3.14

Revision Date: April 24, 2017

1. The resident has the right to appeal a dismissal decision made by the Physics Residency Program Committee (PRPC).
2. Grounds for an appeal are limited to the following:
    a. published regulations and procedures were not followed.
    b. all relevant evidence was not taken into consideration when a decision affecting the resident was made
3. Any resident wishing to appeal a decision of the Physics Residency Program Committee must notify the Program Director in writing of his / her intention to do so within a maximum of two weeks (10 working days) after receiving written notice of the Committee decision. The resident must explain the reasons for the appeal.
4. A separate committee will be established by the Heads of the Clinical Programs at the clinical sites PMH, SOCC, DRCC, SRCC, and CFRCC to consider the appeal submission. Decisions will be communicated to the resident in writing by the committee Chair. The decisions by the committee are final and may not be appealed.

Appendices

A – PRPC Terms of Reference

UTDRO Physics Residency Program

PHYSICS RESIDENCY PROGRAM COMMITTEE TERMS OF REFERENCE

The Physics Residency Program Committee is responsible for:

1. oversight of the financial and human resources and implementation of the Physics Residency Program.
2. maintenance of the academic standards and quality of the curricula for the Physics Residency Program.
3. development, maintenance and review of the policies and procedures for the Physics Residency Program.
4. recommendations regarding the admission procedures and selection criteria for the Physics Residency Program. The admissions committee is responsible for the final selection and approval of all applicants offered admission to the Program.
5. review and coordination of the management of residents who are identified as being in academic or other difficulty.
6. review of evaluations of individual resident performance in the Program and recommendations for promotion, remediation, probation and dismissal to the Director of the Program.
7. maintenance of CAMPEP Accreditation standards for the Program.
8. confirmation that a resident has satisfactorily met requirements for completion of the program.

MEMBERSHIP

1. Program Director (Chair)
2. Odette Cancer Centre Associate Program Director
3. Princess Margaret Cancer Centre Associate Program Director
4. Durham Regional Cancer Centre Associate Program Director
5. Stronach Regional Cancer Center Associate Program Director
6. Credit Valley Hospital Associate Program Director
7. Program Registrar
8. Radiation Oncologist (appointed to the Department of Radiation Oncology University of Toronto)
9. Radiation Therapist (appointed to the Department of Radiation Oncology University of Toronto)
10. Physics Resident (senior resident, term from 6-12 months dependent upon start and end dates of incoming/outgoing resident, alternating between all sites)
11. UTDRO Education Officer (non-voting member)
12. UTDRO Manager (non-voting member)

MEETINGS

The committee will be scheduled to meet minimum four times per year.

B – Clinical Rotations

Rotation Title: External Beam Radiation Therapy (Linacs and Orthovoltage)

Preceptor/Mentor:

Staff Clinical Physicist Selected by Local Associate Program Director /Other Designated Staff as Appropriate (Please Specify)

Duration:

Longitudinal Rotation: 22 months

Rotation Description:

This rotation aims at understanding the principles of linac and orthovoltage unit operation and how to characterize radiation beam parameters (photons and electrons). It includes introducing accelerator engineering (electronics, vacuum systems), reviewing linear accelerator design and performing beam measurements. The resident should participate in and perform daily, weekly, monthly, and annual QA measurements. Ability to perform tests safely and independently is expected, including calibration using AAPM TG-51 (AAPM TG-61 for orthovoltage machines).

Rotation Objectives and Clinical Competencies:

- Explain how major linac components work and how each contributes to the operation of the system
- Explain the design of an orthovoltage unit and its components
- Operate the equipment in a safe and proper manner
- Explain the purpose of and the operation of the safety systems
- Observe, participate and then independently perform routine QC tests (daily, weekly, monthly, annual)
- Demonstrates ability to perform assigned QC tasks in a timely and professional manner
- Explain QC tests, identify failures and interpret results accurately
- Perform equipment calibration following appropriate protocols
- Independently perform absolute dose calibration on a linac following TG-51 for both photon and electron beams
- Demonstrate an understanding of the acceptance and commissioning process (including reference to relevant guidelines and ability to describe the purpose of these activities)
- Summarize and explain patient or staff safety concerns related to linac equipment
- Demonstrate ability to perform acceptance and commissioning tests for a linac (when possible, this will be accomplished through involvement in a clinical commissioning activity)

Format:

Didactic: Recommended, when possible, that resident takes ATeC Course. Recorded lectures will also be available.

Clinical Activities: Including assignment of QC Responsibilities (Daily, Monthly, Annual QC), Response to Machine Downtime, Return to Service QC Activities, Acceptance/Commissioning (if available), Meeting Attendance (if applicable: several sites have meetings for machine physicists that residents will attend)

Clinical Discussions

Evaluation Schema:

Competencies are tracked using Master Rotation List and Signature Sheet.

In-Training Assessment Report (ITAR) completed prior to Year 1 Exam as a Formative Evaluation, and then Completed by Rotation Supervisor at end of Rotation in Summative Manner

- Specific Tasks May be Assessed Individually, such as machine dose calibration, and feedback incorporated by Rotation Supervisor into the final form
- Ability to complete assigned tasks in a timely, reliable and professional manner will be considered in assessment

References

Courses:

ATeC Course (offered through Accelerated Education Program at Princess Margaret)

Local Policies and Procedures

Rotation supervisor will direct resident toward relevant local policies including but not limited to:

- Linac/Orthovolatage QC Tests
- Policies Regarding Dose Adjustment of Machines
- Safety Policies

Textbooks:

Podgorsak E. B., (2005), Radiation Oncology Physics: A Handbook for Teachers and Students, Intl Atomic Energy Agency.

Karzmark C. J., (1997), A Primer on Theory and Operation of Linear Accelerators in Radiation Therapy, Medical Physics Publishing.

Van Dyk, et al., (2005), The Modern Technology of Radiation Oncology, Medical Physics Publishing.

Reports/Guidelines

CPQR Technical Quality Control Guidelines.
AAPM TG-40 and 142.
Calibration Protocols: AAPM TG-21 and 51 and Addendum, TG-61
AAPM TG 218 (Tolerance limits and methodologies for IMRT measurement-based verification QA)

ITAR: Equipment: External Beam RT

Rating Scale:

1	2	3	4	5
Below Expectations For Training Level		**Meets Expectations** For Training Level		**Exceeds Expectations** For Training Level

IN THIS Medical Physics - Equipment: External Beam Radiation Therapy ROTATION	1	2	3	4	5
1. Resident can explain how major linac components work and how each contributes to operation of the system.	○	○	○	○	○
2. Able to explain the design of an orthovoltage unit and its components.	○	○	○	○	○
3. Operate a Linac in a safe and proper manner.	○	○	○	○	○
4. Can independently perform routine QC tests on a linac (daily, weekly, monthly and annual).	○	○	○	○	○
5. Can explain QC tests, identify failures, and interpret results accurately.	○	○	○	○	○
6. Perform LINAC calibration following appropriate protocols (e.g. TG-51).	○	○	○	○	○
7. Can identify, describe and complete acceptance and commissioning tests for a linac.	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	Acceptable	
1. MEDICAL EXPERT COMPETENCIES including: Carry out professional duties in the face of multiple, competing demands.	Yes	No
2. COMMUNICATOR COMPETENCIES including: Manage disagreements and emotionally charged conversations.	Yes	No
3. COLLABORATOR COMPETENCIES including: Show respect towards collaborators (including fellow residents, physicists and physics associates).	Yes	No
4. LEADER COMPETENCIES including: Contribute to a culture that promotes patient and staff safety.	Yes	No

5. HEALTH ADVOCATE COMPETENCIES including: Improve clinical practice by applying a process of continuous quality improvement to your work.	Yes	No
6. SCHOLAR COMPETENCIES including: Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources.	Yes	No
7. PROFESSIONAL COMPETENCIES including: Exhibit appropriate professional behaviours and relationships in all aspects of practice, demonstrating honesty, integrity, humility, commitment, compassion, respect, altruism, respect for diversity and maintenance of confidentiality.	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	**1**	**2**	**3**	**4**	**5**

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Equipment: Dosimetry

Preceptor/Mentor:

Staff Clinical Physicist Selected by Local Associate Program Director /Other Designated Staff as Appropriate

Duration:

3 months (may be delivered concurrently with other rotation)

Rotation Description:

To provide the resident with practical training in the fundamentals of ionizing radiation dose measurements. The purpose of this rotation is to develop an understanding of the design and characteristics of different types of radiation dosimeters or dosimetry systems and phantoms commonly used in radiotherapy centres. The resident will learn to safely use and operate the dosimeters that they will use at their local training site (related to external beam radiotherapy) through hands-on experience. This rotation also includes patient-specific quality assurance (PSQA). The resident should review and understand the need and objectives of PSQA, demonstrate their understanding of different commercial systems available for measurement-based, and be able to independently perform measurements using the tools available at their centre.

Rotation Objectives and Clinical Competencies:

- Be familiar with dosimeter construction, the mechanism of their response and characteristics of their response.
- Be aware of the advantages and limitations of each dosimeter type, including estimation of dose uncertainty for different dosimeters
- Be able to identify appropriate clinical applications in radiotherapy for different types of dosimeters
- Be able to safely use different types of dosimeters (available at local training site) to acquire measurements for routine applications, including machine QC tests, commissioning or patient-specific QC measurements as appropriate
- Be able to identify appropriate dosimeters for specific clinical measurements, including:
    - Small Field Dosimetry
    - In-Vivo Dosimetry
- Be able to explain what characterization of a dosimeter (commissioning) would need to be completed prior to clinical implementation
- Be able to explain how dosimeters are used to compare measured dose to planned dose, and explain the metrics that can be used to perform that comparison (including composite and gamma analysis)
- Be able to independently perform patient specific QC procedures used at the local institution and perform analysis of those results. This includes performing any calibration of the device(s) used in the centre.

These competencies apply to:

- Ion chambers and electrometers
- Diodes and MOSFETs
- Detector Arrays (Ion Chamber and Diode)
- TLD and OSLD Dosimeters
- Film (Radiographic and Radiochromic) and Film Processors and/or Scanners
- Water Tank
- Dosimeters for Radiation Protection (Survey Meters, Scintillation Detectors, etc.)
- Diamond Detectors

Format:

May include a combination of labs, interactive discussions with faculty, self-directed learning and observation, participation and independent execution of clinical activities using dosimeters at local training site (e.g. QC measurements.)

Evaluation Schema:

Individual items will be tracked and signed off in the Master Rotation List and Signature Sheet

Rotation Supervisor will Complete a Single Summative Rotation Evaluation (attached ITAR)

- Assessment will ensure that listed objectives are met, and can include feedback from faculty involved in labs, clinical activities, discussions, etc.

References

Local Policies and Procedures

Rotation Supervisor will direct residents to relevant local policies and procedures and manuals:

- For dosimeters in their department
- Procedures and/or Policies (e.g. thresholds) for Patient Specific QC measurements.
- Procedures and/or Policies for in-vivo dosimetry measurements.

Textbooks:

"The Physics of Radiology", Johns & Cunningham, Chapter 7

" Introduction to Radiological Physics and Radiation Dosimetry", Attix, Chapter 12

Reports/Guidelines:

1. Report of AAPM Task Group 155: Megavoltage photon beam dosimetry in small fields and non-equilibrium conditions
2. Report of AAPM Task Group 235 - Radiochromic Film Dosimetry: An update to TG-55
3. AAPM TG 191 Clinical Use of Luminescent Dosimeters: TLDs and OSLDs
4. Dosimetry of small static fields used in external photon beam radiotherapy: Summary of TRS-483, the IAEA-AAPM international Code of Practice for reference and relative dose determination
5. Tolerance Limits and Methodologies for IMRT Measurement-Based Verification QA: Recommendations of AAPM Task Group No. 218
6. TG-120: Dosimetry tools and techniques for IMRT
7. Accelerator beam data commissioning equipment and procedures: Report of the TG-106 of the Therapy Physics Committee of the AAPM
8. TG-69: Radiographic film for megavoltage beam dosimetry
9. TG-062: Diode in Vivo Dosimetry for Patients Receiving External Beam Radiation Therapy

ITAR: Equipment: Dosimetry

Rating Scale:

1	2	3	4	5
Below Expectations For Training Level		**Meets Expectations** For Training Level		**Exceeds Expectations** For Training Level

IN THIS Medical Physics – Dose Measurement Tools/System ROTATION	**1**	**2**	**3**	**4**	**5**
1. The resident can describe the construction of different dosimeters, the mechanism of their response and characteristics of their response.	○	○	○	○	○
2. The resident can identify appropriate dosimeter to use for a specific task, and justify by describing advantages and limitations of the dosimeters.	○	○	○	○	○
3. The resident can safely use different types of dosimeters available at their clinical training site for routine applications, including machine QC tests, commissioning or patient-specific QC measurements.	○	○	○	○	○
4. The resident can explain what characterization of a dosimeter (commissioning) would need to be completed prior to clinical implementation.	○	○	○	○	○
5. The resident can perform an in-vivo dose measurement following local procedures.	○	○	○	○	○
6. The resident can demonstrate safe and effective use of detectors for radiation protection applications, and can discuss appropriate detectors for different scenarios.	○	○	○	○	○
7. The resident can independently perform patient specific QC measurements for IMRT/VMAT and determine acceptability of results.	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	**Acceptable**	
1. MEDICAL EXPERT COMPETENCIES including: Determine the most appropriate procedures/techniques to use	Yes	No
2. COMMUNICATOR COMPETENCIES including: Communicate effectively with colleagues using digital technology.	Yes	No
3. COLLABORATOR COMPETENCIES including: Negotiate overlapping and shared responsibilities with other colleagues.	Yes	No
4. LEADER COMPETENCIES including: Set priorities and manage time to integrate practice and personal life.	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Improve clinical practice by applying a process of continuous quality improvement	Yes	No

PROGRESS IN TRAINING – Learner handover	Acceptable	
6. SCHOLAR COMPETENCIES including: Identify, select and navigate pre-appraised resources.	Yes	No
7. PROFESSIONAL COMPETENCIES including: Demonstrate a commitment to excellence in all aspects of practice.	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	**1**	**2**	**3**	**4**	**5**

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Equipment: Imaging (Diagnosis, Simulation, Planning and Delivery)

Preceptor/Mentor:

Staff Clinical Physicist Selected by Local Associate Program Director /Other Designated Staff as Appropriate (Please Specify)

Duration:

2-3 Months (may be spread out over a longer time period if required logistically)

Rotation Description:

The overall goal of this rotation is for the resident to gain an understanding of the role of imaging in radiation therapy, including diagnosis, simulation, planning and delivery. The resident will build upon their prior knowledge of medical imaging (pre-requisite courses) to develop an understanding of how different imaging modalities and techniques are used in the radiotherapy clinic. An understanding of the requirements and/or limitations of a specific modality in each part of the radiotherapy process will be developed, including quality assurance/control, technical limitations, or considerations (including spatial integrity, artifacts, etc.). The resident will learn the operation and QC of CT-Simulation (including 4D CT) and MV and kV imaging systems integrated with the linear accelerator at their local sites. These competencies will be further consolidated through the performance of monthly and annual QC tests. PET and MR imaging for simulation and planning will also be included, and some trainees may need to travel to a different clinical site to complete this component.

Rotation Objectives and Clinical Competencies:

At the end of the rotation resident will be able to:

- Describe imaging systems and their characteristics (including the physics of image formation, required hardware/software, image reconstruction, image quality, dose, etc.)
- Identify how different imaging modalities are used in the radiotherapy treatment process. This includes the use of contrast agents.
- Explain the selection and acceptance criteria for new imaging systems
- Describe the QA programs for each modality
- Discuss how imaging information is used and its impact on clinical activities
- Complete QC tasks for imaging systems at their local site and interpret test results
- Summarize and explain patient and staff safety concerns related to imaging equipment, for example ionizing dose, radiofrequency fields, strong magnetic fields and rapidly alternating gradient magnetic fields
- Siting and regulatory considerations for each modality
- Describe image fusion and registration in the context of treatment planning or image guided radiation therapy and algorithms used for those tasks
- Describe the information technology standards and systems used to store, display and transfer medical images and related data

- Describe the basic elements of an IGRT protocol and perform the basic IGRT process using a phantom. This will be expanded on further in site-specific rotations where residents will need to consider how site-specific factors influence the IGRT procedure and workflow, including thresholds

Format:

Review of the following may be done through didactic sessions with physicists or through self-directed learning

- Imaging Systems
  - 2D X-ray and fluoroscopy (kV)
  - CT
  - MRI
  - Nuclear Medicine – Scintigraphy, SPECT, PET
  - Ultrasound
  - MV Imaging
  - CBCT
- Respiratory Motion Management Systems
  - 4D CT / CBCT (if available)
  - Gating / breath-hold
  - MRI (e.g., CINE imaging)
- Imaging Informatics and Systems
  - DICOM and Data Standards
  - PACS, RIS, Worklist
  - Diagnostic imaging stations and viewing environment
  - Integration with ROIS
  - Quantitative Imaging
  - Image Registration Algorithms

Clinical Discussions

Clinical Activities

- CT-Sim QC (e.g. Daily, Monthly, Annual). Resident will progress from observing, to participating, to being able to complete QC tasks at their training site independently.
- MR-Sim QC (observation and participation at minimum)
- PET/CT-Sim QC observations where available
- EPID QC, 2D kV & CBCT QC (Daily, Monthly, Annual). For certain tests residents will progress from observing, to participating, to being able to complete independently and for other tests only observation required.
- Respiratory Motion Management System QC (e.g., 4D CT) where available
- Image registration exercise
- If opportunity arises, participate in acceptance testing and commissioning
- Required Meeting/Rounds Attendance:
  - Attend any regular QC audit / rounds

Evaluation Schema:

Residents will complete above-described clinical activities and demonstrate above-described competencies.

Individual competencies will be signed off (by different faculty) on the Master Rotation List and Signature Sheet.

Rotation supervisor(s) will complete an end of rotation evaluation using the ITAR Form (attached). Residents are expected to receive a satisfactory evaluation. The rotation supervisor(s) will compile feedback from individual lecturers, lab supervisors, etc. as appropriate.

References

Local Policies and Procedures

1. Hospital-specific policies and procedures
2. Provide access to procedures from other hospitals with equipment not available throughout the program

Textbooks

1. The Essential Physics of Medical Imaging 2nd Ed (Bushberg, Siebert, Leidholt Jr and Boone)
2. The Modern Technology of Radiation Oncology, (Relevant Chapters from all Volumes). J Van Dyk, ed
3. The Basics of MRI (http://www.cis.rit.edu/htbooks/mri/index.html) MRI: From Picture to Proton (2nd edition), D.W.McRobbie, E.A.Moore & M.J.Graves; Cambridge University Press, 2006
4. Medical Imaging Physics 4th Ed (Hendee and Ritenour)

Reports/Guidelines

CPQR Technical Quality Control Guidelines: https://www.cpqr.ca/programs/technical-quality-control/

1. Accelerator integrated cone beam systems for verification imaging
2. Computed tomography simulators
3. Conventional radiotherapy simulators
4. Magnetic Resonance Imaging
5. Positron Emission Tomography – Computed Tomography (PET/CT)

AAPM Reports: https://www.aapm.org/pubs/reports/

1. Report No. 270.A - Practical application of AAPM Report 270 in display quality assurance: A report of Task Group 270 (2020)

2. Report No. 132 - Use of image registration and fusion algorithms and techniques in radiotherapy: Report of the AAPM Radiation Therapy Committee Task Group No. 132 (2017)

Computed Tomography

1. Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities (Health Canada, 2008)
2. Healing Arts and Radiation Protection and associated regulations (543 – radiation safety code)

3. Radiation Emitting Devices Act
4. Report #83 TG66 Quality Assurance for Computed Tomography Simulators and Computed Tomography Simulation Process (2003)
5. Report #91 TG76 The management of respiratory motion in radiation oncology (2006)
6. Report #96 TG23 The Measurement, Reporting, and Management of Radiation Dose in CT (2008)
7. Report #111 TG111 Comprehensive Methodology for the Evaluation of Radiation Dose in X-Ray Computed Tomography (2010)
8. Report #204 TG204 Size-Specific Dose Estimates (SSDE) in Pediatric and Adult Body CT Examinations (2011)
9. Report #220 TG220 Use of Water Equivalent Diameter for Calculating Patient Size and Size-Specific Dose Estimates (SSDE) in CT (2014)
10. Report #233 TG233 Performance Evaluation of Computed Tomography Systems - The Report of AAPM Task Group 233 (2019)
11. Report #246 TG246 Estimating Patient Organ Dose with Computed Tomography: A Review of Present Methodology and Required DICOM Information: A Joint Report of AAPM Task Group 246 and the European Federation of Organizations for Medical Physics (EFOMP) (2019)
12. Report #291 TG291 Principles and Applications of Multi-energy CT Report of AAPM Task Group 291 (2020)

Magnetic Resonance Imaging

1. AAPM Report #100: Acceptance Testing and Quality Assurance Procedures for Magnetic Resonance Imaging Facilities (2010)
2. AAPM Report #28: Quality Assurance Methods and Phantoms for Magnetic Resonance Imaging (1990)
3. ACR MR imaging Quality Control Manual (2015); https://www.acr.org/-/media/ACR/Files/Clinical-Resources/QC-Manuals/MR_QCManual.pdf
4. J.P.Hornak: The Basics of MRI; http://www.cis.rit.edu.htbooks/mri
5. MRI Safety: https://radiology.ucsf.edu/patient-care/patient-safety/mri
6. ACR MR-Safety Manual: https://www.acr.org/-/media/ACR/Files/Radiology-Safety/MR-Safety/Manual-on-MR-Safety.pdf
7. MRI Applications to Oncology: https://www.itnonline.com/article/mri-brings-new-vision-radiation-therapy
8. Positron Emission Tomography

1. Report #108 TG108 AAPM Task Group 108: PET and PET/CT Shielding Requirements (2006)
2. Report #126 TG126 PET/CT Acceptance Testing and Quality Assurance (2019)
3. Report #174 TG174 Task Group 174 Report: Utilization of [18F]Fluorodeoxyglucose Positron Emission Tomography ([18F]FDG-PET) in Radiation Therapy (2019)
4. Report #211 TG211 Classification and evaluation strategies of auto-segmentation approaches for PET (2017)

Treatment Image Guidance

1. Report 75 TG58 Clinical use of electronic portal imaging (2001)
2. Report 104 TG104 The Role of In-Room kV X-Ray Imaging for Patient Setup and Target Localization (2009)

3. Report 179 TG179 Quality assurance for image-guided radiation therapy utilizing CT-based technologies (2012)
4. TG142 Report: Quality assurance of medical accelerators (2009)
5. Report #180 Image Guidance dose delivered during radiotherapy: Quantification, management, and reduction (2018)
6. Publications
1. J. Bussink et al., PET-CT for radiotherapy treatment planning and response monitoring in solid tumors: Nature Reviews Clinical Oncology, Volume 8, Issue 4, p. 233-242 (2011)
2. O. Morin et al, "Megavoltage cone-beam CT: system description and clinical applications," Med. Dosim. 31, 51-61 (2006).
3. D. A. Jaffray, "Kilovoltage volumetric imaging in the treatment room," Frontiers of Radiation Therapy and Oncology 40, 116-131 (2007).
4. Jaffray DA, Langen KM, Mageras G, et al. Safety considerations for IGRT: Executive summary. *Pract Radiat Oncol*. 2013;3(3):167-170. doi:10.1016/j.prro.2013.01.004
5. INTERNATIONAL ATOMIC ENERGY AGENCY, Introduction of Image Guided Radiotherapy into Clinical Practice, Human Health Reports, 2019

Ultrasound

1. AAPM TG 128: Quality assurance tests for prostate brachytherapy ultrasound systems (2008)
2. Quality assurance of U.S.-guided external beam radiotherapy for prostate cancer: Report of AAPM Task Group 154

ITAR: Equipment: Imaging

1	2	3	4	5
Below Expectations For Training Level		**Meets Expectations** For Training Level		**Exceeds Expectations** For Training Level

IN THIS Medical Physics Residency–Equipment: Imaging ROTATION	1	2	3	4	5
1. The resident is able to describe imaging systems (2D MV and kV imaging systems, US, CT, CBCT, PET, NM (SPECT) and MR) and their characteristics.	○	○	○	○	○
2. Can identify how different imaging modalities are used in the radiation therapy process and any safety/regulatory requirements for the imaging modality.	○	○	○	○	○
3. Describe the QC tests required for imaging in the RT setting, including imaging on the LINAC, CT-simulators, and MRI and identify appropriate reference documents.	○	○	○	○	○
4. Can discuss how imaging information is used and its impact on clinical activities: Diagnosis Treatment Planning Treatment Delivery Treatment Response Evaluation	○	○	○	○	○
5. Resident can perform QC tasks for imaging systems at their local site and interpret test results.	○	○	○	○	○
6. Describe image fusion and registration in the context of treatment planning or IGRT and algorithms used for those tasks.	○	○	○	○	○
7. Describe the elements of an IGRT protocol and understands the relationship of these elements with the PTV margin and immobilization.					
8. Describe the information technology standards and systems used to store, display and transfer medical images and related data					

PROGRESS IN TRAINING – Learner handover	Acceptable	
1. MEDICAL EXPERT COMPETENCIES including: Have the knowledge and skill to perform and interpret QC activities and results	Yes	No
2. COMMUNICATOR COMPETENCIES including: Effectively communicates intent and results of performing Imaging Equipment QC	Yes	No
3. COLLABORATOR COMPETENCIES including:	Yes	No

PROGRESS IN TRAINING – Learner handover	Acceptable	
Show respect toward collaborators		
4. LEADER COMPETENCIES including: Set priorities for completing QC activities, including after-hours work	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Improve clinical practice by applying a process of continuous quality improvement	Yes	No
6. SCHOLAR COMPETENCIES including: Aware of emerging imaging science and technology that may impact practice	Yes	No
7. PROFESSIONAL COMPETENCIES including: Demonstrate a commitment to excellence in all aspects of practice.	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	**1**	**2**	**3**	**4**	**5**

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Radiation Safety

Preceptor/Mentor:

Radiation Safety Officer or Designate

Duration:

Longitudinal

Rotation Description:

This rotation covers the principles and practice of Radiation Safety in a Cancer Centre environment.

Rotation Objectives and Clinical Competencies:

The goal of this rotation is to ensure that the resident is familiar with the regulatory framework and principles of modern radiation safety. The rotation will enable the resident to perform tasks related to the development and oversight of a radiation safety program, including components relating to departmental personnel, patients and the public.

At the end of this rotation the resident will be able to:

- Describe/summarize institutional radiation safety policies and procedures and the organization of the local radiation safety program
- Identify and describe the acts, regulations, international and professional guidelines concerning radiation safety (including federal and provincial requirements)
- Perform shielding calculations for bunker or vault design (linac, HDR and CT-sim) and licensing and provide rationale for decisions made within those calculations
- Describe the structure of a radiation safety program in a cancer centre and its importance in a radiation oncology program
- Explain personnel monitoring, including requirements for monitoring, the tools involved, classification of personnel, federal/provincial regulations, reports, etc.
- Discuss requirements for labeling, shipping and receiving radioactive materials (transport of dangerous goods)
- Describe safe handling for open and sealed radioactive sources
- Complete risk estimates from radiation exposure
- Perform radiation survey

Format:

Didactic

Clinical Discussions

Clinical Activities

Required Meeting/Rounds Attendance (Mandatory Radiation Safety Training)

Evaluation Schema:

Individual competencies will be signed off (by different faculty) on the Master Rotation List and Signature Sheet. Residents will need to complete required assignments, activities and participate in the discussion sessions.

Rotation Supervisor will complete a Summative Rotation Evaluation (ITAR document) when all aspects of the rotation are completed, assessment includes:

- Participation in required clinical activities
- Oral assessments

References

1. Local Radiation Safety Manual,
2. Melissa Martin and Patton H. McGinley, (2020) Shielding Techniques for Radiation Oncology Facilities, 3rd Edition, eBook, Medical Physics Publishing.
3. Canadian Nuclear Safety Commission documents, including:
    - Nuclear Safety and Control Act
    - General Nuclear Safety and Control Regulations
    - Class II Nuclear Facilities and Prescribed Equipment Regulation
    - Nuclear Substances and Radiation Devices Regulations
    - Radiation Protection Regulations
    - Packaging and Transport of Nuclear Substances Regulations
4. Health Canada, Safety Code 35: Radiation Protection in Radiology – Large Facilities.
5. International Commission on Radiation Protection (ICRP) publications 60 and 103
6. NCRP report 155, (2006), Management of Radionuclide Therapy Patients.
7. NCRP report 151, (2009), Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-ray Radiotherapy Facilities.
8. NCRP report 147, (2004), Structural Shielding Design for Medical X-ray Imaging Facilities.
9. NCRP report 79, (2004), Neutron Contamination from Medical Electron Accelerators.
10. Transportation of Dangerous Goods Act and relevant Regulations.
11. Healing Arts and Radiation Protection Act and relevant Regulations.
12. Radiation Devices Act and relevant Regulations.

ITAR: Radiation Safety

1	2	3	4	5
Below Expectations For Training Level		**Meets Expectations** For Training Level		**Exceeds Expectations** For Training Level

IN THIS Medical Physics–Radiation Protection & Safety ROTATION	1	2	3	4	5
1. Can summarize institutional radiation safety policies and procedures and the organization of the local radiation safety program.	○	○	○	○	○
2. Identify and describe the acts, regulations, international and professional guidelines concerning radiation safety (including federal and provincial requirements)	○	○	○	○	○
3. Perform shielding calculations for bunker or vault design (linac, HDR and CT-sim) and licensing and provide rationale for decisions made within those calculations	○	○	○	○	○
4. Explain personnel monitoring, including requirements for monitoring, the tools involved, classification of personnel, federal/provincial regulations, reports, etc	○	○	○	○	○
5. Discuss requirements for labeling, shipping and receiving radioactive materials (transport of dangerous goods)	○	○	○	○	○
6. Describe safe handling for open and sealed radioactive sources	○	○	○	○	○
7. Complete risk estimates from radiation exposure	○	○	○	○	○
8. Perform radiation survey	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	**Acceptable**	
1. MEDICAL EXPERT COMPETENCIES including: Perform radiation safety related procedures in a skillful and safe manner, adapting to unanticipated findings or circumstances.	Yes	No
2. COMMUNICATOR COMPETENCIES including: Use communication skills and strategies that help staff/patients understand issues related to radiation safety.	Yes	No
3. COLLABORATOR COMPETENCIES including: Implement strategies to promote understanding, manage differences and resolve conflicts in a manner that supports a collaborative culture.	Yes	No

PROGRESS IN TRAINING – Learner handover	Acceptable	
4. LEADER COMPETENCIES including: Contribute to a culture that promotes patient safety.	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Improve clinical practice by applying a practice of continuous quality improvement.	Yes	No
6. SCHOLAR COMPETENCIES including: Provide feedback to enhance learning and performance.	Yes	No
7. PROFESSIONAL COMPETENCIES including: Demonstrate accountability to patients, society and the profession by responding to societal expectations of physicists.	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	1	2	3	4	5

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Quality Management

Preceptor/Mentor:

Staff Clinical Physicist Selected by Local Associate Program Director /Other Designated Staff as Appropriate (Please Specify)

Duration:

18 Months (longitudinal rotation)

Rotation Description:

This rotation will introduce the concepts of quality management, quality assurance, quality control and continuous quality improvement. The resident will learn the role of the clinical physicist in assuring quality and improving processes in radiation therapy. Topics include tools and concepts related to quality and safety including process development, continuous quality improvement and change management (including control charts, check lists, Pareto charts, etc.), risk management (including failure mode and effect analysis, human factors engineering, standardization and other methods of error reduction), incident management and analysis, just culture, organizational structure, peer review or independent review.

Rotation Objectives and Clinical Competencies:

At the end of this rotation the resident will be able to:

- Explain concepts related to quality and safety
- Identify pertinent guidelines or protocols for quality control recommendations for specific equipment or processes in a radiotherapy centre
- Identify components of a quality program in a radiotherapy centre and describe the structure of the quality program at their own training site
- Demonstrate an understanding of the requirements to run and maintain a quality assurance program and carry out the associated tasks
- Describe tools that can be used for quality improvement and change management
- Identify elements of a quality improvement project/initiative
- Understand the principles of risk management, including failure modes effect, human factors engineering, standardization and other methods of reducing errors.
- Describe mechanisms for incident reporting provincially/nationally
- Explain methods used for incident analysis, learning or management (e.g. investigation frameworks such as Root cause analysis or London Protocol, national/international learning systems, etc.)
- Can define medical events/incidents and their severity and identify provincial/national reporting requirements (includes Vanessa's Law)
- Describe the role of independent audits during commissioning, credentialing or ongoing clinical work (e.g. IROC, RTOG credentialing, on-site measurements by another centre, etc.) and the role physicists play in these activities

Format:

The majority of this rotation will be delivered centrally, with all residents within the same year taking this longitudinal rotation together over the course of 18 months.

Discussion Based Sessions, Assignments, Didactic Lectures will be used, with sessions led by faculty from different training sites.

Sub-Module: Inter-Professional Simulated Incident Investigation. In the second year of this longitudinal rotation, physics residents will participate in a mock incident investigation with second-year RO residents. This activity includes conducting interviews, creating a chronology, application of an incident investigation framework, estimation of dosimetric patient disclosure by the RO.

Clinical Activities

Required Meeting/Rounds Attendance at local centre, to be identified by Rotation Supervisor.

(e.g. weekly incident review committee, Quality Committee)

Evaluation Schema:

Individual competencies will be signed off (by different faculty) on the Master Rotation List and Signature Sheet. Residents will need to complete required assignments, activities and participate in the discussion sessions.

Rotation supervisor(s) will complete an end of rotation evaluation using the ITAR Form (attached). Residents are expected to receive a satisfactory evaluation. The rotation supervisor(s) will compile feedback from individual lecturers/session faculty, completed assignments, etc. as appropriate.

References

Local Policies and Procedures

Rotation supervisor will provide links for local policies/procedures and other documentation related to the local Quality Program, including, but not limited to:

- Program Structure
- Incident Reporting
- Annual Reports

Textbooks

Quality and Safety in Radiotherapy, Editors: T. Pawlicki, P.B. Dunscombe, A.J. Mundt, P. Scalliet (2010)

The Quality Toolbox, Second Edition. N.R. Tague. 2005

Reports/Guidelines

1. The report of Task Group 100 of the AAPM: Application of risk analysis methods to radiation therapy quality management. M.S. Huq et al. Med.Phys. 43(7):4209-4262 (2016).
2. The Royal College of Radiologists et. al., (2008), Towards Safer Radiotherapy, London: The Royal College of Radiologists.
3. World Health Organization et al., (2008), Radiotherapy Risk Profile Technical Manual, World Health Organization.
4. ICRP report 112, (2009), Preventing accidental exposures from new external beam radiation therapy technologies.
5. Task Group No. 198 - An implementation guide for TG-142: QA of medical linear accelerators (2021)
6. www.cpqr.ca : Technical Quality Control Guidelines and Programmatic Asssessment.
7. www.rosis.info
8. ASTRO White Papers (https://www.astro.org/White-Papers.aspx)

Publications

*Recommended. Most of these will be covered in assignments during the course.

1. Huq M. S. et al., (2008), A Method for Evaluating Quality Assurance Needs in Radiation Therapy, IJROBP, 71:S170-S173

2. Bogdanich W, Ruiz RR. Radiation Errors Reported in Missouri. New York, NY: New York Times; 2010, A17.

3. CoxHealth. CoxHealth announces some BrainLAB stereotactic radiation therapy patients received increased radiation dose; 2010.http://www.coxhealth.com/body.cfm?id=3701.

4. Executive TS. Unintended Overexposure of Patient Lisa Norris During Radiotherapy Treatment at the Beatson Oncology Centre, Glasgow in January 2006. Edinburgh: The Scottish Executive; 2006.

5. Benkimoun, P. French Hospital and its staff are charged over radiotherapy errors. BMJ 2012;345:e6802.

6. Peifert D, Simon J-M, Eschwege F. L'Accident d'Epinal: passé, present, avenir. Cancer Radiother. 2007 Nov;11(6-7):309-12. (abstract is available in English).

7. Engels B, Soete G, Verellen D, Storme G. Conformal arc radiotherapy for prostate cancer: increased biochemical failure in patients with distended rectum on the planning computed tomogram despite image guidance by implanted markers. Int J Radiat Oncol Biol Phys. 2009;74:388–391.

8. Peters LJ, O'Sullivan B, Giralt J, et al. Critical impact of radiotherapy protocol compliance and quality in the treatment of advanced head and neck cancer: results fromTROG02.02. J ClinOncol. 2010;28:2996–3001.

9. Ohri N, Shen XL, Dicker AP, Doyle LA, Harrison AS, Showalter TN. Radiotherapy protocol deviations and clinical outcomes: a meta-analysis of cooperative group clinical trials. Jnci-J Natl Cancer I. Mar 2013;105:387–393.

10. IAEA: Radiation Safety: Trait Talks Handbook. 2021. [radiation-safety-culture-trait-talks.pdf (iaea.org)]

11. Mardon RE, Khanna K, Sorra J, Dyer N, Famolaro T. Exploring relationships between hospital patient safety culture and adverse events. J Patient Saf. Dec 2010;6:226–232.

12. Kusano AS, Nyflot MJ, Zeng J, et al. Measurable improvement in patient safety culture: a departmental experience with incident learning. Pract Radiat Oncol. 2015;5:e229–237.

13. Liszewski et al. Mitigating the Barriers to a Culture of Quality and Safety in Radiation Oncology. Clinical Oncology. 29(10): P676-679 (2017).

14. *Learning from adverse events: Fostering a just culture of safety in Canadian hospitals and health care institutions*. Ottawa, ON: Canadian Medical Protective Association; 2009.

15. Just Culture from the Health Quality Council of Alberta (HQCA). https://justculture.hqca.ca/what-is-a-just-culture/

16. Fairchild A, Collette L, Hurkmans CW, et al. Do results of the EORTC dummy run predict quality of radiotherapy delivered within multicentre clinical trials? Eur J Cancer. Nov 2012;48:3232–3239.

17. Kirby TH, Hanson WF, Gastorf RJ, Chu CH, Shalek RJ. Mailable TLD system for photon and electron therapy beams. Int J Radiat Oncol Biol Phys. Feb 1986;12:261–265.

18. Ibbott G, Ma CM, Rogers DW, Seltzer SM, Williamson JF. Anniversary paper: fifty years of AAPM involvement in radiation dosimetry. Med Phys. Apr 2008;35:1418–1427.

19. Agarwal JP et al. An Audit for Radiotherapy Planning and Treatment Errors from a Low-Middle-Income Country Centre Clinical Oncology. 31(1): E67-E74 (2019).

20. Kalet AM, Gennari JH, Ford EC, Phillips MH. Bayesian network modelsfor error detection in radiotherapy plans. Phys Med Biol.2015;60:2735–2749.

21. Breen S, Zhang B. Audit of an automated checklist for quality control of radiotherapy treatment plans. Radiother Oncol. Dec;97(3): 579-84 (2010).

22. Pawlicki T, Whitaker M, Boyer AL. Statistical process control for radiotherapy quality assurance. Med Phys. 2005 (Sep; 32(9): 2777-86 (2005).

ITAR: Quality Management

Rating Scale:

1	2	3	4	5
Fails to Meet Essential Competencies		**Meets Essential Competencies**		**Demonstrates Enhanced Competencies**

IN THIS Medical Physics – QUALITY MANAGEMENT ROTATION	**1**	**2**	**3**	**4**	**5**
1. Can explain concepts related to quality and safety (e.g. quality management, quality assurance, quality control, continuous quality improvement)	○	○	○	○	○
2. Can identify pertinent guidelines or protocols for quality control recommendations for specific equipment or process in a radiotherapy centre.	○	○	○	○	○
3. Can appreciate the requirement for allocation of resources and management of those resources to run and maintain a quality assurance program and carry out the associated tasks	○	○	○	○	○
4. Can describe the role of independent audits and program reviews	○	○	○	○	○
5. Able to understand the principles of risk management and describe tools that can be used for quality improvement.	○	○	○	○	○
6. Able to describe local processes for incident reporting as well as national or international systems.	○	○	○	○	○
7. Can explain methods used for incident analysis (e.g. Root cause analysis or London Protocol)	○	○	○	○	○
8. Understands the principles and implications of human factors engineering.	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	**Acceptable**	
1. MEDICAL EXPERT COMPETENCIES including: Understand that patient safety is a core value of our profession	Yes	No
2. COMMUNICATOR COMPETENCIES including: verbal, written communication with factual presentation, with confidentiality and privacy	Yes	No

PROGRESS IN TRAINING – Learner handover	Acceptable	
3. COLLABORATOR COMPETENCIES including: treating all collaborators with respect, responding positively to constructive feedback and challenges, recognize the roles of team members when dealing with incident investigations	Yes	No
4. LEADER COMPETENCIES including: Contribute to a culture that promotes patient safety and systems thinking in development of radiotherapy processes	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Promote Continuous Quality Improvement	Yes	No
6. SCHOLAR COMPETENCIES including: Engagement in evidence-informed questions to inform others	Yes	No
7. PROFESSIONAL COMPETENCIES including: Demonstrate a commitment to patient safety and quality improvement	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	1	2	3	4	5

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Theory and principles of treatment planning

Preceptor/Mentor:

Staff Clinical Physicist Selected by Local Associate Program Director /Other Designated Staff as Appropriate

Duration:

3 – 4 months

Rotation Description:

This rotation provides residents opportunities to learn basic radiation oncology treatment planning. This rotation provides the theoretical foundation for subsequent site-specific clinical rotations and professional practice.

Rotation Objectives and Clinical Competencies:

At the end of this rotation, the residents will be or will be able to:

- Familiar with general policies and procedures related to treatment planning as applicable at their training site
- Describe the general treatment planning process, specifically:
    - Basics of patient setup and immobilization
        - (e.g. be able to describe common treatment positions, identify different types of immobilization devices, identify technical issues related to patient position and immobilization that are encountered in planning)
    - Beam arrangement options
    - Delivery
- Define treatment planning volumes as defined by ICRU
- Perform basic photon (3D conformal) and electron treatment planning with phantom and patient data
- Accurately perform monitor unit calculations (photon and electron)
- Describe and use tools to aid in treatment plan evaluation for basic photon and electron treatment planning, including dose volume histograms
- Understand dose calculation algorithms and concepts of optimization algorithms as implemented in treatment planning systems
- Create simple IMRT and VMAT plans (e.g. phantom plans) demonstrating understanding of principles of optimization and the influence of optimization settings available in the TPS
- Explain beam modelling process and how to evaluate clinical suitability of a beam model for a treatment planning system
- Familiar with treatment planning system acceptance testing and commissioning
- Be able to navigate through the TPS software as needed for planning, plan evaluation and QC processes and understand data dependencies
- Discuss special treatment planning considerations referring to guidance documents as necessary for the following patient factors:
    - Pregnancy

- Cardiovascular implanted electronic devices
- Prostheses
- Previous radiotherapy

Format:

Didactic lectures, Interactive discussions, Self-directed learning, Hands-on experience with the treatment planning system, observational visits to CT-sim, treatment unit, treatment planning exercises and assignments.

Evaluation Schema:

Individual competencies will be signed off (by different faculty) on the Master Rotation List and Signature Sheet. Residents will need to complete required assignments, activities and participate in the discussion sessions.

Rotation supervisor will complete an end of rotation evaluation using the ITAR Form (attached). Residents are expected to receive a satisfactory evaluation. The rotation supervisor(s) will compile feedback from individual lecturers/session faculty, completed assignments, direct observation of planning skills, etc. as appropriate. A practical final exam is recommended.

References

Local Policies and Procedures

Rotation supervisor will direct residents to local policies and procedures related to treatment planning and manuals as required.

Textbooks

- Johns, H. E., & Cunningham, J. R. (1983). *The physics of radiology*.
- Khan, F. M. (2009). *The Physics of Radiation Therapy*.
- Van Dyk, J. (1999). *The Modern Technology of Radiation Oncology: A Compendium for Medical Physicists and Radiation Oncologists*.

Reports/Guidelines

- TG-119 Ezzell, G. A., Burmeister, J. W., Dogan, N., Losasso, T. J., Mechalakos, J. G., Mihailidis, D., Molineu, A., Palta, J. R., Ramsey, C. R., Salter, B. J., Shi, J., Xia, P., Yue, N. J., & Xiao, Y. (2009). IMRT commissioning: Multiple institution planning and dosimetry comparisons, a report from AAPM Task Group 119. *Medical Physics*, *36*(11), 5359–5373.
- TG53 Fraass, B., Doppke, K., Hunt, M., Kutcher, G., Starkschall, G., Stern, R., & Van Dyke, J. (1998). Quality assurance for clinical radiotherapy treatment planning. *Medical Physics*, *25*(10), 1773–1829.

- TG-25 Gerbi, B. J., Antolak, J. A., Deibel, F. C., Followill, D. S., Herman, M. G., Higgins, P. D., Huq, M. S., Mihailidis, D. N., Yorke, E. D., Hogstrom, K. R., & Khan, F. M. (2009). Recommendations for clinical electron beam dosimetry: Supplement to the recommendations of Task Group 25. *Medical Physics*, *36*(7), 3239–3279.
- TG-166 Li, X. A., Alber, M., Deasy, J. O., Jackson, A., Jee, K.-W. K., Marks, L. B., & Martel, M. K. (2012). The Use and QA of Biologically Related Models for Treatment Planning Report of AAPM Task Group 166.
- TG-203 Miften, M., Mihailidis, D., Kry, S. F., Reft, C., Esquivel, C., Farr, J., Followill, D., Hurkmans, C., Liu, A., Gayou, O., Gossman, M., Mahesh, M., Popple, R., Prisciandaro, J., & Wilkinson, J. (2019). Management of radiotherapy patients with implanted cardiac pacemakers and defibrillators: A Report of the AAPM TG-203†. *Medical Physics*, *46*(12), e757–e788.
- TG-65 Papanikolaou, N., Battista, J. J., Boyer, A. L., Kappas, C., Klein, E., & Mackie, T. R. (2004). AAPM report 85: Tissue Inhomogeneity Corrections for Megavoltage Photon Beams. Report of the AAPM radiation therapy committee task group 65.
- TG-63 Reft, C., Alecu, R., Das, I. J., Gerbi, B. J., Keall, P., Lief, E., Mijnheer, B. J., Papanikolaou, N., Sibata, C., & Van Dyk, J. (2003). Dosimetric considerations for patients with HIP prostheses undergoing pelvic irradiation. Report of the AAPM Radiation Therapy Committee Task Group 63. *Medical Physics*, *30*(6), 1162–1182.
- TG-36 Stovall, M., Blackwell, C. R., Cundiff, J., Novack, D. H., Palta, J. R., Wagner, L. K., Webster, E. W., & Shalek, R. J. (1995). Fetal dose from radiotherapy with photon beams: Report of AAPM Radiation Therapy Committee Task Group No. 36. *Medical Physics*, *22*(1), 63–82.
- TRS-430: Commissioning and Quality Assurance of Computerized Planning Systems for Radiation Treatment of Cancer. IAEA (2004).
- ICRU Reports 83, 50 and 62

Publications

1. Ahnesjo A. Collapsed cone convolution of radiant energy for photon dose calculation in heterogeneous media. Med Phys. 1989 Jul-Aug;16(4):577-92.
2. Ahnesjo A, Saxner M, Trepp A. A pencil beam model for photon dose calculation. Med Phys. 1992 Mar-Apr;19(2):263-73.
3. Drzymala RE, Mohan R, Brewster L, Chu J, Goitein M, Harms W, Urie M. Dose-volume histograms.Int J Radiat Oncol Biol Phys. 1991 May 15;21(1):71-8.
4. Venselaar J, Welleweerd H, Mijnheer B. Tolerances for the accuracy of photon beam dose calculations of treatment planning systems. Radiother Oncol. 2001 Aug;60(2):191-201.
5. Van Dyk J, Barnett RB, Cygler JE, Shragge PC. Commissioning and quality assurance of treatment planning computers. Int J Radiat Oncol Biol Phys. 1993 May 20;26(2):261-73.
6. Ezzell GA, Galvin JM, Low D, Palta JR, Rosen I, Sharpe MB, Xia P, Xiao Y, Xing L, Yu CX; IMRT subcommitte; AAPM Radiation Therapy committee. Guidance document on delivery, treatment planning, and clinical implementation of IMRT: report of the IMRT Subcommittee of the AAPM Radiation Therapy Committee. Med Phys. 2003 Aug;30(8):2089-115.
7. T.R. Mackie, J.W. Scrimger, J.J. Battista, "A convolution method of calculating dose for 15-MV x rays, " Med. Phys. 12, 188-196 (1985)
8. Pianykh O. S., (2011) Digital Imaging and Communications in Medicine (DICOM): A Practical Introduction and Survival Guide (2nd Ed.), Springer.
9. HL7 org., (2007-2015), http://www.hl7.org/implement/standards/rim.cfm

10. ML Kessler, Image Registration and data fusion in radiation therapy. BJR. 79(2006), S99-s108.
11. Manufacturer's White Papers (e.g. EUD and DMPO for Pinnacle^3)
12. QUANTEC papers.

ITAR: Treatment Planning Theory and Principles

Rating Scale:

1	2	3	4	5
Fails to Meet Essential Competencies		**Meets Essential Competencies**		**Demonstrates Enhanced Competencies**

IN THIS PROGRAM NAME–ROTATION NAME ROTATION – Treatment Planning Principles	**1**	**2**	**3**	**4**	**5**
1. Understand beam modelling for treatment planning system; Describe and perform tests required for acceptance and commissioning of a treatment planning system	○	○	○	○	○
2. Perform basic photon and electron treatment planning	○	○	○	○	○
3. Describe treatment planning process	○	○	○	○	○
4. Demonstrate manual monitor unit calculation competence (photon and electron)	○	○	○	○	○
5. Understand dose calculation and concepts of optimization algorithms as implemented in local treatment planning systems	○	○	○	○	○
6. Demonstrate treatment plan evaluation for basic photon and electron treatment planning including assessment of dose volume histograms	○	○	○	○	○
7. Special factors: a. Pregnancy b. Cardiovascular implanted electronics devices c. Prosthesis d. Previous radiotherapy	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	**Acceptable**	
1. MEDICAL EXPERT COMPETENCIES including: Practice medical physics within their defined scope of practice and expertise	Yes	No
2. COMMUNICATOR COMPETENCIES including: Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy	Yes	No

PROGRESS IN TRAINING – Learner handover	Acceptable	
3. COLLABORATOR COMPETENCIES including: Work effectively with physicians, physicists and other colleagues in the health care professions	Yes	No
4. LEADER COMPETENCIES including: Contribute to the improvement of health care delivery in teams, organizations, and systems	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Improve clinical practice by applying a process of continuous quality improvement	Yes	No
6. SCHOLAR COMPETENCIES including: Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources	Yes	No
7. PROFESSIONAL COMPETENCIES including: Exhibit self-awareness and manage influences on personal well-being and professional performance	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	1	2	3	4	5

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Clinical Treatment Planning

Preceptor/Mentor:

Staff Clinical Physicist Selected by Local Associate Program Director /Other Designated Staff as Appropriate (Please Specify)

Duration:

7-10 Months

Rotation Description:

The main objectives for this clinical rotation is for the resident to demonstrate competence in the generation of treatment plans for clinical sites treated with radiation therapy. For each anatomical site, the resident will be expected to learn the common radiation treatment techniques, the planning methods used, the advantages and limitations of each technique and the uncertainties associated with target definition, dose calculation and treatment. Technical considerations for specific sites will also be addressed. This rotation is divided into multiple sub-rotations (these will require a rotation evaluation form for each sub-rotation) as well as some additional modules related to specialized techniques.

Residents will complete this rotation at their local site if possible, while traveling to other centres for techniques that are not offered at their local training site. This will include, but is not limited to, travel for total skin electron irradiation (TSEI), total body irradiation (TBI), head and neck and stereotactic radiosurgery (SRS).

Rotation Objectives and Clinical Competencies (Applicable for Clinical Sites):

At the end of this rotation, for each treatment site or clinical technique, the resident will be able to:

- Review clinical management of relevant sub-sites: staging, diagnosis, treatment options (including combined modality options), outcomes, toxicities.
- Review target definitions (per ICRU) for each relevant sub-site
- Review relevant EBRT techniques (simulation, treatment and IGRT techniques), prescriptions (dose-fractionation schemes), normal tissue tolerances (metrics and toxicities)
- Observation of clinical activities, that may include:
    - Simulation (CT and MR as applicable at training site)
    - Treatment planning by experienced planner
    - External beam treatment with daily image guidance
- Create example plans using training cases covering a range of sub-sites, related physics topics, and treatment techniques (3D-CRT, IMRT/VMAT)
- Review common planning strategies, desirable plan features (DVH metrics, dose conformality and heterogeneity, dose distribution) and provide critique of clinical treatment plans
- Review chart checking with physicists, with a focus on site-specific details
- Review special physics considerations and procedures related to the clinical site

Competencies:

- Be able to articulate details of clinical management of relevant sub-sites including staging, diagnosis, treatment options, outcomes, and toxicities
- Be able to generate 3D-CRT and IMRT/VMAT plans for a variety of specified sub-sites
- Be able to evaluate the quality of plans and determine if plans are clinically acceptable
- Be able to articulate reasons for clinical unacceptability to team members, correct quality deficiencies in the plan and provide constructive advice for unacceptable treatment plans
- Understand the rationale and source of various technical aspects of site-specific planning and treatment protocols: choice of immobilization, simulation scan and fusion details, PTV margins, beam arrangement and isocentre placement, plan evaluation metrics (DVH metrics, dose distribution, conformality and heterogeneity), IGRT scan and evaluation details.
- Be able to provide consultation for CT-simulation, MR-simulation (where applicable), image fusion, treatment planning, patient set-up issues, image guidance

The above objectives and competencies apply to each of the sub-rotations. Please see the sub-rotation sections for additional site-specific objectives and references.

Format:

The Clinical Planning rotation is divided into sub-rotations, each of which can have a different rotation supervisor assigned and will be independently evaluated.

These sub-rotations are:

- Palliative
- Breast
- Lung
- Genitourinary (GU)
- Gastrointestinal (GI)
- Gynaecological
- Central Nervous System (CNS)
- Head and Neck

  Sub-Rotations can be completed in any order, except for the Palliative Rotation which should be completed first.

Additional Modules will be completed in:

- Stereotactic Body Radiotherapy (if needed)
- Stereotactic Radiosurgery
- Total Body Irradiation
- Orthovoltage Radiotherapy

Foundational work

- Review clinical details for each sub-site, including clinical management, staging, diagnosis, treatment options, toxicities.
- Review may be done through didactic session(s) with radiation oncologists and / or physicists as appropriate, or through self-directed learning. A "Q&A" session with appropriate radiation oncologists and / or physicist may also be arranged to clarify concepts.

Clinical Discussions

- Rotation supervisor discussions:

    - Kick-off meeting to discuss expectations of the rotation (duration, activities, timeline and evaluation)
    - Discuss development of technical protocols: including simulation details (scan details, patient preparation, immobilization, image fusion), choice of PTV, source of dose-volume plan evaluation metrics, development of IGRT guidelines
    - Review of treatment planning exercises (multiple sessions)
    - Review special physics topics outlined under objectives (not covered in other rotations) and general troubleshooting for this site (related to simulation, planning and treatment)
    - Discuss implications of SBRT for site: simulation, treatment planning and treatment
    - Overview of plan QC, with a focus on site-specific details

Clinical Activities

- Observation of clinical activities:

    - CT-simulation, including review of patient preparation procedures / patient education materials
    - MR-simulation (where relevant)
    - Image fusion (where relevant)
    - Normal tissue anatomical contouring with planning team and / or radiation oncologist
    - Tumor localization and target definition / contouring with radiation oncologist
    - Treatment planning with experienced planner

- External beam treatment with daily image guidance
- Radiation oncology clinic: accompany radiation oncologist to new patient, radiation review and follow-up patient appointments (can also be done as part of inter-disciplinary rotation)
- Shadow physics plan QC with staff physicists, with a focus on site-specific details

Required Meeting/Rounds Attendance

- Observe multi-disciplinary peer review activities (eg weekly case review rounds, independent review with radiation oncologist and / or planner)

Evaluation Schema:

Clinical Site Sub-Rotations

The following specific competencies will be evaluated for each of the sub-rotations:

1. Ability to explain disease management and treatment options
2. Ability to describe simulation, target definition, normal tissue definition, plan generation strategies and acceptability criteria for main disease subsites
3. Ability to create clinically-acceptable treatment plans for main disease subsites following local protocols
4. Ability to perform plan review independently and communicate changes that must be made if plan is not clinically acceptable
5. Ability to respond to consults from radiation oncologist, planner, or treatment units on clinical issues.

Evaluation may be done throughout the rotation in a variety of ways, including:

- Rotation supervisor discussions
- Presentation of self-directed learning material (eg clinical site details)
- Review of treatment planning exercises
- Observation of, or review of independent plan QC (eg plan assessment details or checklists submitted to rotation supervisor)
- Final rotation evaluation (e.g. Multi-disciplinary oral evaluation session, practical test with site-based scenarios)
- Other competency based assessments as appropriate

All Competencies will be tracked and signed off in the Master Rotation & Signature List as they are completed.

Rotation supervisor will complete an end of rotation evaluation using the ITAR Form (attached). Residents are expected to receive a satisfactory evaluation. The rotation supervisor(s) will compile feedback from other involved faculty/staff members, the assessment activities described above, direct observation, etc,. as appropriate. A formal rotation exam must include an oral evaluation and may include a hands-on component.

Modules:

All Competencies will be tracked and signed off in the Master Rotation & Signature List as they are completed.

References

Local Policies and Procedures

- Local clinical management guidelines
- Local simulation, treatment planning, treatment delivery and IGRT protocols/workflows
- Local guidelines for use of material/density overrides in treatment planning
- Local guidelines for troubleshooting simulation, planning and IGRT issues

Textbooks

- Principles and Practice of Radiation Oncology (4th edition) by Carlos Perez et al.
- Treatment planning in radiation Oncology (Chapter 14). Faiz M.Khan
- Radiation Therapy Planning (Second edition). Gunilla C. Bentel
- Computerized Radiation treatment Planning Systems (Chapter 8). Jacob Van Dyk.

Reports/Guidelines

- **ICRU Report 50, *Prescribing, Recording, and Reporting Photon Beam Therapy***
- **ICRU Report 62, *Prescribing, Recording and Reporting Photon Beam Therapy (Supplement to ICRU Report 50)***

- TG-63 report: Dosimetric considerations for patients with hip prostheses undergoing pelvic irradiation https://www.aapm.org/pubs/reports/detail.asp?docid=81
- TG-101 report: Stereotactic body radiation therapy: The report of AAPM Task Group 101

Palliative Rotation

The palliative rotation focuses on use of 3DCRT techniques for palliative treatment or simple IMRT or VMAT. This rotation does not include SBRT for oligometastatic disease.

This rotation is completed immediately after completion of Treatment Planning Principles.

Competencies described in general document apply to the palliative techniques for the following sites at minimum:

- Whole Brain RT
- Spine (C, T, L) or Sacral treatments
- Pelvic
- Lung
- Sternum
- Clinical Mark-Ups

Specific objectives/competencies related to palliative treatment planning not included in general description:

- Technical challenges related to patient positioning or immobilization
- Consideration of patient factors (such as pain, previous RT) in treatment planning process
- Ability to develop clinically acceptable 3DCRT palliative plans in clinically relevant timelines for local institution

GU Rotation

Sub-Sites Include: Prostate (intact and post-op), Bladder, Kidney, Seminoma, and Penile cancers

GU Specific Objectives (some of these could be covered in GYN or GI rotations):

- Use of strategies for improving setup and / or dosimetry: fiducial markers, hydrogel spacers, enemas etc
- Metal hip prostheses
- Weight loss/gain (tissue excess/deficit) on treatment
- The impact of gas (rectal and bowel) on dosimetry
- Hypofractionation for prostate cancer
- Scrotal shielding (clam shell) and scatter dose

GU References

Textbooks

- Recent advances in the management of high-risk localized prostate cancer: Local therapy, systemic therapy, and biomarkers to guide treatment decisions, 2020 ASCO educational book
- Principles and Practice of Radiation Oncology (4th edition) by Carlos Perez et al. ?

Reports/Guidelines

- TG-63 report: Dosimetric considerations for patients with hip prostheses undergoing pelvic irradiation https://www.aapm.org/pubs/reports/detail.asp?docid=81
- TG-101 report: Stereotactic body radiation therapy: The report of AAPM Task Group 101

Publications

- Prostate hypofractionation: Morgan et al. Hypofractionated Radiation Therapy for Localized Prostate Cancer: Executive Summary of an ASTRO, ASCO, and AUA Evidence-based guideline. Practical Radiation Oncology 8: 354-360 (2018).
- Bladder: Lenis et al. Bladder Cancer: A review. JAMA 324(19): 1980-1991 ,2020.
- Seminoma: Wilder et al. Radiotherapy Treatment Planning for Testicular Seminoma. Int J Radiat Oncol Biol Phys 83(4): e445-e452, 2012.
- Penile: Korzeniowski and Crook. Contemporary role of radiotherapy in the management of penile cancers. Transl Androl Urol 6(5): 855-867, 2017.

GI Rotation

GI Sub-Sites include: Rectum, anal canal, esophagus and liver SBRT.

GI Specific Objectives (some of these could be covered in other sub-rotations):

- Includes ability to create 3-field rectum plan, even if that is not current clinical standard
- Impact of CIED presence on treatment planning for Upper GI sites
- Metal hip prostheses
- Weight loss/gain (tissue excess/deficit) on treatment
- The impact of gas (rectal and bowel) on dosimetry
- Immobilization for prone positioning
- Motion management

GI References

Publications

- Technical aspects of radiation therapy for anal cancers. Eli D at el. *J Gastrointest Oncol 2014;5(3):198-211*
- Gastrointestinal radiation injury: Symptoms, risk factors and mechanism. Abobakr K Shadad et al. *World J Gastroenterol 2013 January 14; 19(2): 185-198*
- A review of dosimetry studies on external-beam radiation treatment with respect to second cancer induction. X George Xu, et al. *Phys. Med. Biol. 53 (2008) R193–R241*
- INTENSITY-MODULATED RADIATION THERAPY, PROTONS, AND THE RISK OF SECOND CANCERS. Eric J. Hall. *Int. J. Radiation Oncology Biol. Phys., Vol. 65, No. 1, pp. 1–7, 2006*
- Volumetric-modulated arc therapy for the treatment of a large planning target volume in thoracic esophageal cancer. Ahmar S. Abbas, Douglas Moseley, Zahra Kassam, Sun Mo Kim, Charles Cho; *Journal of Applied Clinical Medical Physics, Vol. 14, No. 3, 2013 (192-202)*
- Dosimetric comparison of helical tomotherapy, RapidArc, and a novel IMRT & Arc technique for esophageal carcinoma. Spencer Martin. et al. *Radiotherapy and Oncology 101 (2011) 431–437*
- Volumetric Modulated Arc Therapy with Simultaneous Integrated Boost for Locally Advanced Rectal Cancer. S. Cilla et al. *Clinical Oncology 24 (2012) 261-268*
- *DETERMINATION OF RESPIRATORY MOTION FOR DISTAL ESOPHAGUS CANCER* USING FOUR-DIMENSIONAL COMPUTED TOMOGRAPHY. Brain P. Yaremko et al. *Int. J. Radiation Oncology Biol. Phys., Vol. 70, No. 1, pp. 145–153, 2008*
- *Interfractional dose variations in the stomach and the bowels during* breathhold intensity-modulated radiotherapy for pancreatic cancer: Implications for a dose-escalation strategy. Akira Nakamura et al. *Med. Phys. 40 (2), February 2013*
- CONFORMITY INDEX: A REVIEW. LOÏC FEUVRET et al. *Int. J. Radiation Oncology Biol. Phys., Vol. 64, No. 2, pp. 333–342, 2006*
- NCCN Clinical Practice Guidelines in Oncology gastric.pdf (nccn.org) and others.

GYN Rotation

GYN sub-sites include: Cervix (intact and post-op), Endometrium (post-op), Vulva, Vagina and Ovarian cancers.

GYN Specific Objectives (some of these could be covered in other sub-rotations):

- Use of strategies for improving setup uncertainty: internal target volumes, enemas etc
- Metal hip prostheses
- Weight loss/gain (tissue excess/deficit) on treatment
- The impact of gas (rectal and bowel) on dosimetry
- Surface dosimetry and bolus placement for superficial targets (eg vulva, inguinal nodes)

Identify Specific Planning Activities

- Create example plans using training cases for 3D-CRT and VMAT
  - Four-field box
  - Post-op VMAT
  - Intact-cervix VMAT (optional: with SIB)
  - Vulva
  - Optional: parametrial and/or nodal boosts

GYN References

Reports/Guidelines

- TG-63 report: Dosimetric considerations for patients with hip prostheses undergoing pelvic irradiation https://www.aapm.org/pubs/reports/detail.asp?docid=81
- IMRT Guidance Document for Cervical Cancer CCO GYN CoP
- EMBRACE-II study protocol

Publications

- Consensus Guidelines for Delineation of Clinical Target Volume for Intensity-Modulated Pelvic Radiotherapy in Postoperative Treatment of Endometrial and Cervical Cancer - 10.1016/j.ijrobp.2007.09.042

Breast Rotation

Breast site-specific objectives or competencies:

- Ability to describe in detail the simulation and treatment delivery aspects of the main treatment techniques listed in the Sub-Module/Activities section (observation) including considerations for imaging (free-breathing, breath-hold, active breathing control, etc.) and relevant immobilization devices and considerations for patient stability.
- Understanding of the many heart sparing techniques available for breast patients including breath hold techniques.
- Ability to generate plans for the following techniques:
    - 2-field treatment planning of whole breast using single photon energy (and wedges, if available in TPS training institution)
    - 2-field treatment planning of whole breast using MLC and mixed photon energies
    - 2-field treatment planning of chestwall with and without bolus
    - 3/4-field treatment planning with regular and wide (modified) tangents
    - 4-field treatment planning with electron patch (optional)
    - Sequential and/or simultaneous integrated boost treatment planning
    - Inverse treatment planning (IMRT or VMAT) for breast (optional)
    - Treatment planning of a complex breast case (very large treatment volume) requiring an unconventional field arrangement.
    - Specialized treatment planning – observation only, of one or more specialized techniques available at training center (bilateral breast, complex breast with IMRT, APBI, breast SBRT, magnetic resonance linear accelerator, high dose rate brachytherapy, etc.)
- Observation of clinical activities:
    - Observe CT simulation for standard whole breast/chestwall (i.e. 2-field technique) and whole breast/chestwall+nodal volume irradiation (i.e. 4-field technique)
    - Observe 2-field and 4-field treatment planning with planner
    - Observe wide tangent treatment planning with planner
    - Observe 2-field and/or 4-field treatment delivery
    - Observe breath hold simulation and treatment
    - Observe prone breast simulation and treatment (if available)
    - Shadow chart/plan review with rotation supervisor.
    - Observe specialized planning, if time allows (bilateral, APBI, complex breast, SBRT, etc.)

Breast References

Reports/Guidelines

Smith B, Bellon J, Blitzblau R, Freedman G, Haffty B, Hahn C, Halberg F, Hoffman K, Horst K, Moran J, Patton C, Perlmutter J, Warren L, Whelan T, Wright J, Jagsi R. Radiation therapy for the whole breast: Executive summary of an American Society for Radiation Oncology (ASTRO) evidence-based guideline. Pract. Radiat. Oncol. 8(3): 145-152, 2018.

American Cancer Society (https://www.cancer.org/cancer/breast-cancer.html)

Publications

Kestin LL, Sharpe MB, Frazier RC, Vicini FA, Yan D, Matter RC, Martinez AA, Wong JW. Intensity modulation to improve dose uniformity with tangential breast radiotherapy: initial clinical experience. International Journal of Radiation Oncology* Biology* Physics. 2000 Dec 1;48(5):1559-68.

Bartlett, F. R., Colgan, R. M., Carr, K., Donovan, E. M., McNair, H. A., Locke, I., Evans, P. M., Haviland, J. S., Yarnold, J. R., & Kirby, A. M. (2013). The UK HeartSpare Study: Randomised evaluation of voluntary deep-inspiratory breath-hold in women undergoing breast radiotherapy. *Radiotherapy and Oncology*, *108*(2), 242–247. https://doi.org/10.1016/j.radonc.2013.04.021

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Lung Rotation

Lung Site-Specific Objectives Include:

- Rationalize the use of 4DCT and discuss the way these images are produced
- Observe and discuss breathing motion management strategies

Exclusions: Treatment planning for Mesothelioma is not included in this rotation.

Lung References

Textbooks

Principles and Practice of Radiation Oncology (4th edition) by Carlos Perez et al., Chapter 44

Practical Radiotherapy Planning (3rd edition) by Jane Dobbs et al

Radiotherapy in Practice – External Beam Therapy by Peter Hoskin

Treatment Planning in Radiation Oncology (2nd edition) by Faiz Khan & Roger Potish

Radiation Treatment Planning (2nd edition) by Gunilla Bentel

Chao et al, Radiation Oncology: Management Decisions, Chapter 30.

The Modern Technology of Radiation Oncology, Vol. II, Jake Van Dyk ed., Ch. 8

Reports/Guidelines

THE MANAGEMENT OF RESPIRATORY MOTION IN RADIATION ONCOLOGY REPORT OF AAPM TASK GROUP 76, PJ Keall et al, Med. Phys. 33, 3874-3900, 2006.

STEREOTACTIC BODY RADIATION THERAPY: THE REPORT OF AAPM TASK GROUP 101, SH Benedict et al, Med. Phys. 37, 4078-4101, 2010

Papers

STATE-OF-THE-ART LUNG CANCER RADIATION THERAPY, J Belderbos and Jan Jakob Sonke, Expert Review of Anticancer Therapy. 9.10 (Oct. 2009): p1353.

RADIOTHERAPY IN SMALL-CELL LUNG CANCER: LESSONS LEARNED AND FUTURE DIRECTIONS, B.J. SLOTMAN, S. SENAN, Int. J. Radiation Oncology Biol. Phys., Vol. 79, No. 4, pp. 998–1003, 2011

DOSIMETRIC PREDICTORS OF RADIATION-INDUCED LUNG INJURY L.B. MARKS, Int. J. Radiation Oncology Biol. Phys., Vol. 54, No. 2, pp. 313–316, 2002.

THE USE OF POSITRON EMISSION TOMOGRAPHY (PET) IN THE STAGING/EVALUATION, TREATMENT, AND FOLLOW-UP OF PATIENTS WITH LUNG CANCER: A CRITICAL REVIEW, M. MAC MANUS, RJ. HICKS, Int. J. Radiation Oncology Biol. Phys., Vol. 72, No. 5, pp. 1298–1306, 2008.

ARE THE RESULTS OF RTOG 0617 MYSTERIOUS? JAMES D. COX, Int. J. Radiation Oncology Biol. Phys., Vol. 82, No. 3, pp. 1042–1044, 2012.

CONE-BEAM COMPUTED TOMOGRAPHIC IMAGE GUIDANCE FOR LUNG CANCER RADIATION THERAPY, J-P Bissonnette et al., Int. J. Radiation Oncology Biol. Phys., Vol. 73, No. 3, pp. 927–934, 2009.

EFFECT OF IMAGE-GUIDANCE FREQUENCY ON GEOMETRIC ACCURACY AND SETUP MARGINS IN RADIOTHERAPY FOR LOCALLYADVANCED LUNG CANCER, JA Higgins et al., Int. J. Radiation Oncology Biol. Phys., Vol. 80, No. 5, pp. 1330–1337, 2011.

RESPIRATORY CORRELATED CONE BEAM CT, JJ Sonke et al., Med Phys 32, 1176–1186, 2005.

PRACTICAL CONSIDERATIONS ARISING FROM THE IMPLEMENTATION OF LUNG STEREOTACTIC BODY RADIATION THERAPY (SBRT) AT A COMPREHENSIVE CANCER CENTER, J. Thorac. Oncol. 3, 1332-41, 2008.

COMPARISON OF RESIDUAL GEOMETRIC ERRORS OBTAINED FOR LUNG SBRT UNDER STATIC BEAMS AND VMAT TECHNIQUES: IMPLICATIONS FOR PTV MARGINS. A. Vloet et al, Phys. Med. 52, 129-132, 2018. https://doi.org/10.1016/j.ejmp.2018.07.009

DOSIMETRIC EVALUATION OF HETEROGENEITY CORRECTIONS FOR RTOG 0236: STEREOTACTIC BODY RADIOTHERAPY OF INOPERABLE STAGE I-II NON–SMALL-CELL LUNG CANCER, Int. J. Radiat. Oncol. Biol. Phys. 73, 1235-42, 2009

Head and Neck Rotation

Note: DRCC, CFRCC and SRCC do not have head and neck RT programs. This rotation is facilitated by all observation and clinic visits occurring at one of the primary sites. Cases for planning practice are shared to each site so that the resident can complete planning on their own TPS.

All Objectives (including independent planning and plan review) apply to the following Sub-Sites and Techniques:

- Early Glottis
- Oropharynx (unilateral and bilateral elective neck volumes)
- Nasopharynx
- Other sub-sites will be discussed

Head and Neck Site-Specific Objectives/Competencies:

- Mandatory visit to an RO Review Clinic (patients on treatment to appreciate H&N site specific concerns related to acute treatment effects)
- Understanding of planning strategies related to inhomogeneities in the head and neck (e.g. dental artifacts)
- Describe rationale, role and importance of optimization volumes and evaluation volumes in H&N (including, but not limited to, cropping PTVs from patient surface, overlap with OARs, PRVs, multiple dose levels)

H&N References

Textbooks

- Principles and Practice of Radiation Oncology (4th edition) by Carlos Perez et al.
- Treatment planning in radiation Oncology (Chapter 14). Faiz M.Khan

Publications

Grégoire et al. Delineation of the neck node levels for head and neck tumors: A 2013 update. DAHANCA, EORTC HKNPSCG, NCIC CTG, NCRI, RTOG, TROG consensus guidelines. http://dx.doi.org/10.1016/j.radonc.2013.10.010

Relevant QUANTEC Papers, including salivary gland function, optic structures and neural structures.

CNS Rotation

Sites/Techniques include primary tumors (e.g. glioblastoma (GBM) and whole CNS tumors), as well as benign and metastatic.

Not all techniques (e.g. whole CNS) are treated at all primary/affiliate sites. Cases and planning protocols will be shared between sites as required to facilitate achievement of objectives at all training sites.

CNS Specific Objectives include:

- Understand application of 3DCRT for whole CNS treatment, including technical issues and requirements related to junctioning. Discuss simulation, planning and treatment delivery procedures.
- Ability to describe clinical IMRT protocol used at one of the primary sites for whole CNS, Discuss simulation, planning and treatment delivery procedures.
- Identify and describe different immobilization systems
- Resident must plan simple and complex brain cases using IMRT and VMAT, and be able to discuss pros and cons of each (including beam arrangement, including use of non-coplanar beams)
- Role of MR imaging in CNS

Stereotactic Radiosurgery Module

*May be incorporated into the CNS rotation

Residents from affiliate sites may complete this rotation at one of the primary sites if linac-based SRS not a technique at their site. Observation for the GammaKnife component can also be arranged in addition to the competencies completed for local linac-based technique.

Objectives and Clinical Activities:

- Observe GK: frame-placement, frame- and mask-based simulation, planning and treatment
- To observe and make notes on several SRS procedures.
- Review PTV margins in brain cases
- Review CNS-related treatment issues: dose conformity, low-dose spread, OAR dose constraints, toxicities of concern for OAR, cord-re-irradiation dose tolerance, SRT vs standard fractionation, various modes of SRS (pros and cons)
- Observe a few Linac-based patient treatments, including setup and CBCT
- Attend CNS rounds and observe SRS physician QA.
- Understand GK/SRS QA for stereotactic: daily, monthly, annually.
- For at least one SRS mode be able to perform QA: daily, monthly, annually.
- Understand a linac QA including alignment and dose.
- Be familiar with planning procedures.
- Plan 1 Gamma Knife (or SRS) case independently. These must be assessed by an experienced physicist.
- Be familiar with Gamma Knife (SRS) chart checking procedure.
- To be familiar with planning procedures (but not necessarily to be able to efficiently plan a patient for treatment without further experience).

Evaluation:

Rotation Supervisor will sign appropriate items on Master Rotation and Signature List. At this time, no rotation evaluation form is completed for this module.

References

Local Policies and Procedures

- Local clinical management guidelines
- Local simulation, treatment planning, treatment delivery and IGRT protocols/workflows
- Local guidelines for use of material/density overrides in treatment planning
- Local guidelines for troubleshooting simulation, planning and IGRT issues

Textbooks

- The Modern Technology of Radiation Oncology (Van Dyk) Chapter 16, "Stereotactic Irradiation"

Reports/Guidelines

- AAPM Report No. 54: Stereotactic Radiosurgery, Report of Task Group 42, Radiation Therapy Committee
- Intracranial stereotactic positioning systems: Report of the American Association of Physicists in Medicine Radiation Therapy Task Group No. 68, Med Phys 32(7) pg 2380-98 (2005)
- CPQR Technical Quality Control Guidelines for Gamma Knife Radiosurgery (2016). http://www.cpqr.ca/wp-content/uploads/2017/01/GKR-2016-06-01.pdf
- Manuals and presentations for Stereotactic Treatments.
- AAPM-RSS Medical Physics Practice Guideline 9.a. for SRS-SBRT

Total Body Irradiation Module (TBI)

This module is completed at Princess Margaret Cancer Centre for all residents.

Module Format

Approximately 2 Days in length.

Didactic Sessions/Self Learning: Physics and Radiation Oncology Didactic Sessions are offered annually on TBI

Clinical Observations:

- CT simulation
- Treatment Planning
- Treatment Delivery, including in vivo dosimetry

References:

Will be provided by the Module lead.

Objectives:

- Understand clinical rationale and uses for TBI
- Describe technique for Total Body Irradiation
- Contrast current technique with other techniques in literature, including conformal and VMAT techniques
- Able to discuss technical challenges in simulation, planning and delivery for TBI
- Able to discussion commissioning required for a TBI technique

ITAR: Clinical Treatment Planning

Rating Scale:

1	2	3	4	5
Fails to Meet Essential Competencies		**Meets Essential Competencies**		**Demonstrates Enhanced Competencies**

IN THIS Medical Physics Residency– Clinical Treatment Planning ROTATION	1	2	3	4	5
1. Can explain management of disease and treatment options for this clinical site.	○	○	○	○	○
2. Can describe simulation, target definition, normal tissue definition, plan generation strategies and acceptability criteria for this clinical site	○	○	○	○	○
3. Can create clinically acceptable treatment plans for indications within this disease site following local protocols	○	○	○	○	○
4. Able to perform plan review and effectively communicate changes that must be made if the plan is not clinically acceptable.	○	○	○	○	○
5. Able to respond to consults from radiation oncologists, planner or treatment units on clinical issues encountered throughout the radiotherapy treatment process.	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	Acceptable	
1. MEDICAL EXPERT COMPETENCIES including: Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety	Yes	No
2. COMMUNICATOR COMPETENCIES including: Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy.	Yes	No
3. COLLABORATOR COMPETENCIES including: Work effectively with physicians and other colleagues in the health care professions.	Yes	No
4. LEADER COMPETENCIES including: Contribute to the improvement of health care delivery in teams, organizations, and systems. Contribute to a culture that promotes patient safety	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner.	Yes	No
6. SCHOLAR COMPETENCIES including: Engage in the continuous enhancement of their professional activities through ongoing learning. Teach students, residents, the public, and other health care professionals.	Yes	No

PROGRESS IN TRAINING – Learner handover	**Acceptable**	
7. PROFESSIONAL COMPETENCIES including: Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	**1**	**2**	**3**	**4**	**5**

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

Rotation Title: Brachytherapy

Preceptor/Mentor:
Physicist as assigned by Associate Program Director at each clinical site

Duration:
3-4 Months

Rotation Description:
This rotation will provide the resident with practical training in brachytherapy that will enable them to work safely and effectively in the clinic. The resident will learn the principles of brachytherapy, treatment techniques, indications for treatment, treatment planning and simulation procedures, treatment time and calculation methods. They will also learn about the equipment used in brachytherapy, calibration, dose verification and quality assurance procedures. The resident will also be trained in radiation safety procedures related to brachytherapy. Specifically, they will learn about brachytherapy planning and delivery for prostate (HDR and I-125 seed implants), gynae (HDR, including MR-guided HDR), and residents are encouraged to research other sites (breast, lung, eye plaques and skin) and observe if available at their centre.

Rotation Objectives and Clinical Competencies:
- Discuss and contrast the merits of Brachytherapy in opposition to external beam RT.
- List and understand concepts of the physical properties of commonly used sources
- Describe the energy range used in brachytherapy and contrast/compare with energy used in external beam
- Describe and perform dose calculations based on formalism from TG-43
- Illustrate depth-dose curve for commonly used sources and compare/contrast to those of external beam energies
- Describe radiation safety as related to brachytherapy and perform CNSC mandated QA of HDR units
- Describe equipment used in seed or source calibration, describe methodology and perform seed/source calibration
- Describe commissioning tasks and information necessary for a treatment planning system
- Describe and perform daily, quarterly and annual QA of remote afterloaders (beginning with observation and moving to participation and independent performance)
- Describe commissioning tasks for an afterloader and applicable auxiliary equipment
- List brachytherapy modalities and compare/contrast them
- List common cancers treated with brachytherapy
- List commonly encountered symptoms of these cancers and know doses, fractionation schemes, and modality used in brachytherapy treatment
- List organs at risk and their tolerances to radiation dose (or accepted dose limits)
- Perform treatment planning for the common sites treated with brachytherapy (prostate LDR, prostate HDR, GYN HDR)
- Illustrate DVH for tumor and organs at risk, and compare/contrast to those of external beam

- Understand impact of energy, activity/AKS, dwell time, and source position on DVH and dose delivered to tumor and organs at risk
- Perform physics review of treatment plans

Format:

This rotation will consist of didactic lectures, interactive discussions, self-directed learning, patient QA rounds, virtual learning, and hands-on experience where possible.

Residents are encouraged to research other sites (breast, lung, eye plaques and skin) and observe if available at their centre. If resident is progressing through residency well, they may discuss with the Rotation Supervisor and Associate Program Director opportunities to arrange observation at other training sites.

Evaluation Schema:

Individual competencies will be signed off (by different faculty) on the Master Rotation List and Signature Sheet. Residents will need to complete required assignments, activities and participate in the discussion sessions.

Rotation supervisor will complete an end of rotation evaluation using the ITAR Form (attached). Residents are expected to receive a satisfactory evaluation. The rotation supervisor(s) will compile feedback from individual lecturers/session faculty, completed assignments, direct observation of planning skills, etc. as appropriate. A formal rotation exam must include an oral evaluation and may include a hands-on component.

Suggested References

Local Policies and Procedures

Rotation Supervisor will provide/direct residents to local policies and procedures as applicable including, but not limited to:

- Safety/Emergency Procedures
- Treatment Planning
- QC and Equipment (including manuals as needed)

Textbooks

- The Physics of Radiology (Fourth Edition) by Harold Johns & John Cunningham (Chapter 13)
- The Physics of Radiation Therapy (Second Edition) by Faiz M. Khan (Chapter 15)
- The Modern Technology of Radiation Therapy (Volume 1) by Jake Van Dyk (Chapter 18)

- The Modern Technology of Radiation Therapy (Volume 2) by Jake Van Dyk (Chapter 10)
- Principles and Practice of Radiation Oncology (Fourth Edition) by Carlos Perez et al. (Chapters 17, 18, 19, 20)
- AAPM summer school proceedings: Brachytherapy Physics (2005 and 2017)
- Clinical Brachytherapy Physics by Rivard, Beaulieu and Thomadson (2017)
- The Physics of Modern Bracytherapy for Oncology by Baltas, Sakelliou and Zamboglue (2006)

Reports/Guidelines

- AAPM Task Group Report No. 43: Dosimetry of interstitial brachytherapy sources. Med. Phys. 22:209-234; 1995.
- Update of AAPM Task Group No. 43: A revised AAPM protocol for brachytherapy dose calculations. Med. Phys. 31:633-674; 2004.
- Supplement to the 2004 update of the AAPM Task Group No. 43 Report, Med Phys 34(6), p. 2187-2205 (2007)
- AAPM Task Group Report No. 64: Permanent prostate seed implant brachytherapy. Med. Phys. 26:2054- 2076; 1999.
- AAPM Task Group Report No. 56: Code of practice for brachytherapy physics. Med. Phys. 24:1557-1598; 1997.
- AAPM Task Group Report No. 59: High dose-rate brachytherapy treatment delivery. Med. Phys. 25:375- 403; 1998.
- AAPM Task Group Report No. 40: Comprehensive QA for radiation oncology. Med. Phys. 21:581-618; 1994 (Part B Section V. pg 598-607).
- AAPM Task Group Report No. 53: QA for clinical radiotherapy treatment planning. Med. Phys. 25: 1773- 1829; 1998. (section relevant to brachytherapy)
- AAPM Task Group 128: Quality assurance tests for prostate brachytherapy ultrasound systems. Medical Physics, 35, 5471-5489 (2008)
- AAPM Report 21 by Task Group 32: Specification of Brachytherapy Source Strength (1987)
- AAPM Task Group Report No. 64: Permanent prostate seed implant brachytherapy: Med Phys 26(10), p. 2054-2076 (1999)
- AAPM recommendations on dose prescription and reporting methods for permanent interstitial brachytherapy for prostate cancer: Report of Task Group 137. https://doi.org/10.1118/1.3246613 (2009)
- Third-Party brachytherapy source calibrations and physicist responsibilities: Report of the AAPM Low Energy Brachytherapy Source Calibration Working Group, Med Phys 35(9), p.3860-3865 (2008)
- AAPM Task Group Report No. 137: AAPM Recommendations on Dose Prescription and Reporting Methods for Permanent Interstitial Brachytherapy for Prostate Cancer, Med Phys 36(11), p.5310-5322 (2009)
- Report of the Task Group 186 on model-based dose calculation methods in brachytherapy beyond the TG-43 formalism: Current status and recommendations for clinical implementation. Medical Physics, 39, 6208-6236 (2012)
- Commissioning and Quality Assurance of Computerized Planning Systems for Radiation Treatment of Cancer, Technical Reports Series No 430, IAEA, Vienna (2004)

- ACR-AAPM Technical Standard for HDR Brachy (2015)
- ACR-AAPM Technical Standard for LDR Brachy (2015)
- ICRU report 38: Dose and volume specification for reporting intracavitary therapy in gynecology, (1985)
- ICRU report 58: Dose and volume specification for reporting interstitial therapy, (1997)
- ICRU report 89: Prescribing, Recording, and Reporting Brachytherapy for Cancer of the Cervix, (2016)
- Report of the American Brachytherapy Society: Intraoperative planning and evaluation of permanent prostate brachytherapy. Int. J. Rad. Onc. Biol. Phys. 51(5);1422-1430; 2001.
- The American Brachytherapy Society recommendations for high dose-rate brachytherapy for carcinoma of the cervix. Int. J. Rad. Onc. Biol. Phys. 48(1);201-211; 2000.
- The American Brachytherapy Society recommendations for low dose-rate brachytherapy for carcinoma of the cervix. Int. J. Rad. Onc. Biol. Phys. 52(1);33-48; 2002.
- ESTRO Handbook of Brachytherapy Chapters 14-16
- CPQR Guidelines
- Consensus guidelines for various modalities in Brachytherapy, 11(1), p.6-57 (2012)

Publications

- GEC-ESTRO Working groups
- 2012 ABS Consensus Guidelines for Adjuvant Vaginal Cuff Brachytherapy
- 2012 ABS Consensus Guidelines for Locally Advanced Cervix Ca Part 1 General Principles
- 2012 ABS Consensus Guidelines for Locally Advanced Cervix Ca Part 2 HDR
- Haie-Meder C. et al., Recommendations from Gynaecological (GYN) GEC-ESTRO Working Group (I): concepts and terms in 3D image based 3D treatment planning in cervix cancer brachytherapy with emphasis on MRI assessment of GTV and CTV, Radiotherapy and Oncology 74, p.235-245 (2005)
- Pötter R. et al., Recommendations from gynaecological (GYN) GEC ESTRO working group (II): Concepts and terms in 3D image-based treatment planning in cervix cancer brachytherapy -3D dose volume parameters and aspects of 3D image-based anatomy, radiation physics, radiobiology, Radiotherapy and Oncology 78, p.67-77 (2006)
- Hellebust T.P. et al., Recommendations from Gynaecological (GYN) GEC-ESTRO Working Group: Considerations and pitfalls in commissioning and applicator reconstruction in 3D image-based treatment planning of cervix cancer brachytherapy, Radiotherapy and Oncology 96, p.153-160 (2010)
- Dimopoulos J.C.A. et al., Recommendations from Gynaecological (GYN) GEC-ESTRO Working Group (IV): Basic principles and parameters for MR imaging within the frame of image based adaptive cervix cancer brachytherapy, Radiotherapy & Oncology 103, p.113-122 (2012)
- GEC ESTRO Concepts and Terms for MRI Assessment of Volumes
- New interstitial HDR brachytherapy technique for prostate cancer: CT based 3D planning after transrectal implantation. Radiotherapy & Oncology 52:257-260; 1999.
- High dose-rate afterloading 192Iridium prostate brachytherapy: Feasibility Report.
- Int. J. Rad. Onc. Biol. Phys. 41(3);525-533-1430; 1998.
- Calibration of 192Iridium high dose rate afterloading systems. Med. Phys. 18:462-467; 1991.

- Post-operative high dose-rate brachytherapy in patients with low to intermediate risk endometrial cancer. Radiotherapy & Oncology 56:17-22; 2000.
- 3D CT-based HDR breast brachytherapy implants: treatment planning and QA. Int. J. Rad. Onc. Biol. Phys. 59(4);1224-1228; 2004.
- HDR Brachytherapy for medically inoperable stage I endometrial carcinoma. Gynecologic Oncology 71;196- 203; 1998.
- Radiation biology in brachytherapy (review article). J. of Surg. Onc. 65:66-70; 1997
- HDR Brachytherapy QA: A practical guide. Biomedical Imag. and Interventional J. 2006; 2(2): e(34)

ITAR: Brachytherapy

Rating Scale:

1	2	3	4	5
Fails to Meet Essential Competencies		**Meets Essential Competencies**		**Demonstrates Enhanced Competencies**

IN THIS UTDRO Medical Physics Residency – Brachytherapy Rotation	1	2	3	4	5
1. Understands and is able to fulfill the CNSC mandates regarding safety, security and QA of HDR radiation source	○	○	○	○	○
2. Describe dose calculations for brachytherapy used in treatment planning systems	○	○	○	○	○
3. List and understand concepts of the physical properties of commonly used brachytherapy sources	○	○	○	○	○
4. Describe equipment used in seed or source calibration, describe methodology and perform seed/source calibration and QA	○	○	○	○	○
5. Understand impact of energy, activity/AKS, dwell time, and source position on DVH and dose delivered to tumor and organs at risk	○	○	○	○	○
6. Perform treatment planning for the common sites treated with brachytherapy (prostate LDR, prostate HDR, GYN HDR)	○	○	○	○	○
7. Able to perform and describe rationale, requirements, and frequency for quality assurance tests for an HDR afterloader with corresponding tolerance and action levels	○	○	○	○	○
8. List common cancers treated with brachytherapy with corresponding clinical protocols, fractionation schemes, target, and OAR dose limits	○	○	○	○	○

PROGRESS IN TRAINING – Learner handover	Acceptable	
1. MEDICAL EXPERT COMPETENCIES including: Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety	Yes	No
2. COMMUNICATOR COMPETENCIES including:	Yes	No

PROGRESS IN TRAINING – Learner handover	Acceptable	
Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy		
3. COLLABORATOR COMPETENCIES including: Work with physicians and other colleagues in the health care professions to promote understanding, manage differences, and resolve conflicts	Yes	No
4. LEADER COMPETENCIES including: Contribute to the improvement of health care delivery in teams, organizations, and systems	Yes	No
5. HEALTH ADVOCATE COMPETENCIES including: Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner	Yes	No
6. SCHOLAR COMPETENCIES including: Engage in the continuous enhancement of their professional activities through ongoing learning. Contribute to the creation and dissemination of knowledge and practices applicable to health	Yes	No
7. PROFESSIONAL COMPETENCIES including: Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards	Yes	No
8. The resident is on an appropriate trajectory for this point in training	Yes	No
9. Are there any areas that need focused work in the next rotation? (If yes, please describe)	Yes	No

OVERALL performance related to this educational experience	1	2	3	4	5

Feedback & Comments
Describe Strengths
Actions or Areas for Improvement
Other Comments

C - Physics Resident Tutorial/Evaluations

Physics Residency Program Tutorial/Evaluation Sessions

1. Attendance at Physics Resident Tutorial/Evaluation sessions is a required component of the Residency program. These sessions are the main evaluation tool for competencies gained, outside of clinical rotations. They plan an important role programmatically on development of resident's oral communication skills around clinical and technical topics.

2. Each resident will be evaluated on each topic, and a pass level is considered a score >70%. There are approximately 14-18 evaluations per year.

3. The sessions will be held close to bi-weekly throughout the program beginning winter semester of the first year at all sites. Affiliate sites may make arrangements with one of the primary sites for residents to attend tutorials at a primary site for a portion or all of the residency. This should be done in discussions involving the Associate Program Directors and Program Director. This encourages the development of relationships between residents.

4. Tutorial/Evaluation Sessions are lead by a local staff physicist and are attended by up to 2 additional staff physicists.

5. The resident sessions' main objectives are to provide a practice forum for the residents and an evaluation of resident progress for staff physicists. The format is to discuss fundamental clinical physics issues related to the clinical rotations as well as advanced concepts. These are oral question-answer sessions with residents taking a turn at the blackboard to answer questions posed by the staff physicists on the pre-selected topic. Residents are encouraged to use diagrams, graphs and/or equations to support their answer.

6. Residents are expected to have studied and prepared in advance for these sessions.

   Preparation may include reading material, reviewing clinical policies and procedures and/or practical preparation if appropriate. Faculty physicists are always a resource and residents should reach out to Associate Program Director for assistance if they are not receiving adequate assistance in directing preparation.

7. The Resident session topics are listed below. This list serves as a guideline and does not define the order of topics. The list can be rearranged or a particular topic could be expanded. All topics listed should be covered and additional topics added if deemed necessary. The list also provides a guideline for studying, and the residents should study the complete subject, even if the topic is not covered in the tutorial. Flexibility for additional topics is built in, and use of the "Current and Emerging" topics can be used to address optional curricular topics (from CAMPEP Accreditation Standards) or other topics that arise within the field.

<u>Scheduling Tutorials</u>

Residents are responsible for coordinating their tutorials with the help of the administrative staff. The exact process will be defined by each local site. The scheduling should include identification of the topic they will address in the tutorial with the following provisions:

a. Effort should be made to follow the order suggested in the list.

b. Effort should be made to avoid cancellation of the session.

c. The resident must come prepared (i.e., have studied) for the session.

d. All topics in the list should eventually be covered.

e. Note that the nature of the flexibility also means that each resident could address a different section of a topic in a given session. This is dependent upon logistical considerations at each site.

<u>Reference List (not exhaustive):</u>

1. ICRU Reports.
2. AAPM TG-Reports
3. CPQR Technical Quality Control Guidelines
4. IAEA Documents, Textbooks
5. Int. J. Radiation Oncology Biol. Phys. Vol. 21, pp. 109-122.
6. F.M.Khan, "The Physics of Radiation Therapy". 3rd edition.
7. Van Dyk, "Modern Technology of Radiation Oncology." (Vol 1-3)
8. CCPM Membership Exam Practice Questions, Parts III and IV (latest edition)
9. RAPHEX Compendia of Radiation oncology physics Practice Questions

The references provide only a starting point. **The residents should compile their own material and hopefully expand the list for future residents.** It is suggested that the residents consult physicists for appropriate reference material.

A sub-topic list will also be provided as a further study guide and to assist in selection of appropriate references.

<u>Evaluation</u>

The residents will be evaluated after each session.

Faculty should provide specific feedback (both positive and constructive) to the residents individually. Faculty will complete the required evaluation form and review with the resident.

Resident Topic List

	Topic	Year		Suggested References
		1	2	
1	Interaction of Ionization with Matter Basic Interactions of Photons with Matter	X		- Johns & Cunningham Chapters 5 & 6 - Attix,
2	Measurement of Radiation Dosimetry, Quality of X-Rays	X		Johns & Cunningham Chapters 7 & 8,
3	Radiation Biology	Radiobiology Course Preferred	X	Johns & Cunningham, Ch. 17 Hall, Ch. 1-3, 5-13,
4	Linear Accelerators (Design, QC and Commissioning)	X	X	Karzmark, SIMAC Tool, QC Guidelines
5	Quality Assurance Principles and Tools	X	X	
6	Calibration TG-21/TG-51/Amendments	X	X	- AAPM TG-21 - AAPM TG-51, Addendum
7	Single Photon Beams (Beam Parameters, Characterization) (including, profiles, TPR, PDD, RDF, etc.)	X		Johns & Cunningham Chapter 10 Khan Chapters 9 and 10,
8	MU Calculations	X		Johns & Cunningham Chapter 10 Khan Chapters 9 and 10,
9	Treatment Planning: Single Beams/Combination of Beams (Dose Distributions, Junctions)	X		- Johns & Cunningham Chapter 11.01 - 11.06 - TG-65,
10	Dose Calculation Algorithms	X	X	Johns & Cunningham Chapter 12.01 - 12.06,
11	Brachytherapy Fundamentals (Basics: Isotopes, Activity, TG-43,Equipment, QC) etc.)	X	X	Johns & Cunningham Chapter 13.01 - 13.13 AAPM Brachy Summer School,
12	IMRT and Hypofractionation (IMRT, VMAT, SBRT)	X	X	Van Dyk Vol 1, Sec. 8.4 Ch. 12.1, 13,
13	IGRT	X	X	
14	Imaging (Simulation and Diagnostic)	X	X	Christensen Van Dyk, Vol. 1, Ch. 5 & 7,
15	Radiation Protection & Safety Treatment room design	X	X	- Hospital Policies and Procedures documents Johns & Cunningham, Ch. 15, NCRP 151, NCRP 49 McGinley

16	Specialized Techniques (TBI, Stereotactic, TSEI, IORT, etc.)		X	Van Dyk Vol 1, Sec. 8.4 Ch. 12.1, 13,
17	Radiosurgery		X	Van Dyk, Vol. 1 Ch. 12 Van Dyk, Vol. 2 Ch. 4
18	Clinical Treatment Planning: Superficial Lesions (Electrons and Orthovoltage)		X	
19	Current or Emerging Clinical Topics	X	X	
20	Current or Emerging Clinical Topics	X	X	

RESIDENT TUTORIAL EVALUATION FORM

At each resident tutorial 2 to 4 staff physicists will attend and evaluate the performance of a resident on a particular topic. Each topic will have several questions. A satisfactory evaluation is overall achieving a mark of >70%. Each physicist will complete a tutorial evaluation sheet at the end of each tutorial and submit these to the Associate Program Director.

Resident:
Physicist:
Tutorial Topic:
Date of Evaluation:

Q	**Subtopic**	**Satisfactory (yes/no)**	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Feedback:

Signature of Resident (signifies evaluation has been discussed with resident)

Signature of Evaluator

Date

Date

D – Medical Physics Residency Journal Club

Terms of Reference

UTDRO Medical Physics Residency Journal Club

Purpose

This terms of reference serves as the guiding document for The UTDRO Medical Physics Residency Journal Club. The goals of the UTDRO Medical Physics Residency Journal Club are to

- Provide a platform for connecting medical physics residents across all UTDRO affiliated cancer centres.
- Provide residents a chance to practice and further develop their teaching, presentation and communication skills
- Facilitate knowledge exchange, promote discussion about current and emerging topics in medical physics and radiation oncology via journal club presentations.

Membership

The UTDRO Medical Physics Residency Journal Club consists of all UTDRO physics residents and a Medical Physicist mentor. Other individuals may be asked to participate through invitation by the aforementioned group.

Expectations: Meeting Attendance, Time Commitment, etc.

- Attendance: All members are strongly encouraged to attend the journal club. A minimum of 7 residents and one physicist is required for the session to commence. Residents will record attendance in their own log book.
- Agenda: The Chief Resident is to share the relevant reading material no later than one week prior to presentation to allow members to familiarize themselves with the topic. The Chief Resident is to inform the group of any changes or cancellations as soon as possible.
- Presenter schedule: the presenter for an upcoming session shall be chosen using a random number generator at the end of each session, with accommodation made to individuals' schedules. Volunteers are welcome. Each resident is expected to present at least once during the course of residency.

- Presentation topics: each resident will choose one topic from the AAPM Task Group reports curated by the residency program and one topic of their choice, preferably focused on/informed by their clinical development project.
- Preparation: each presenter shall inform the chief resident and the presiding physicist about the topic of their choice at least one week prior to the presentation date, together with the relevant reading material. The presenter shall prepare a 15-20 minute presentation including discussion points for group discussion.
- Conduct of Meeting: Chief resident shall chair meetings, introduce the speakers, and manage time. Physicist mentor shall moderate and guide the discussions as needed. All members are encouraged to participate in discussions.
- Length and frequency of sessions: the sessions are held on the last Friday of each month, starting at 4 pm, Eastern time. The length of the sessions is one hour. This time can be reviewed annually.
- Record Keeping: The Chief Resident shall maintain a list of the presented topics, together with the presentation slides and the shared reading materials provide by the presenters. An up to date list is to be sent to the program director on regular basis.

Participant	Requirements
All Residents	Attend sessions, be familiar with the topic (e.g. motivation for the work and some key conclusions/takeaways), participate in discussions
Presenter	Inform the physicist and chief resident of the topic of presentation and provide some key references for the group, at least a week before the presentation. Prepare a 15-20 minute presentation with discussion points
Chief Resident	Chair sessions, circulate materials, keep members informed of updates/changes, report to the program director
Physicist Mentor	Participate in the sessions, brainstorming topics, guide discussions
Program Director	Supervise/ provide feedback

Decision Making

Decisions pertaining to any changes in the frequency and time of the sessions will be made with input from all members and by the majority vote, subject to approval by the program director. A minimum of 6 session per year is required by the residency program. The journal club topics will be chosen by the presenter and vetted by the presiding physicist. Any other changes to the program will be made under the supervision of the program director.

Revision date: July 2021	Reviewed and approved by: AM, AL

E – Physics Resident Rotation Master List & Signature Sheet

ROTATION MASTER LIST AND SIGNATURE SHEET

a) Equipment: Dose Measurement Tools/Systems

Topic	Date	Signature
Orientation to dose measurement and instrumentation		
Dosimetry Instrumentation (includes theory, clinical use, QC, etc.) :		
Ion Chambers and Electrometers		
Diodes and MOSFETS		
Detector Arrays		
TLD and OSLD Dosimeters		
Film and Film Processors/Scanners		
Diamond Detectors		
Water Tank		
Dosimeters for Radiation Protection (Survey Meters, Scintillation Counters, etc.)		
Patient Specific QC Measurements (Acquisition, Analysis and Interpretation)		

b) Equipment: Imaging (Diagnosis, Planning and Delivery)

Topic	Date	Signature
Fluoroscopy		
Portal Imaging (MV)		
Portal Imager QC		
2D kV Imaging		
2D kV Imaging QC		
Cone-beam CT		
CBCT QC		
CT Sim		
CT Sim QC		
MR and MR Sim		
MR Sim QC		
CT/PET Sim		
3D Ultrasound Systems		
IGRT (on linac): Perform and understand basic workflow		
Respiratory Motion Management Systems		
Imaging Informatics and Systems		

c) Equipment: External Beam Radiation Therapy

Topic	Date	Signature
Linac Intro and Operation (Authorization Completed)		
Linac QC: Daily		
Linac QC: Weekly/Monthly		
Linac QC: Annual		
Linac Calibration (AAPM TG-51)		
Photons		
Electrons		
Linac Acceptance Testing and Commissioning		
ATEC Course Completed*		
Orthovoltage Intro and Operation		
Orthovoltage QC: Daily		
Orthovoltage QC: Weekly/Monthly		
Orthovoltage QC: Annual		
Orthovoltage Calibration (AAPM TG-61)		

d) Quality Management

Topic	Date	Signature
QA Program		
Quality Assurance Principles and Concepts		
QC Guidelines/Recommendation Documents		
Quality Tools (including FMEA, SPC, etc.)		
Incident Reporting, Analysis and Classification		
Independent Audits		

e) Radiation Protection and Safety

Topic	Date	Signature
Radiation Safety Program		
Acts, Regulations and Guidelines		

ALARA Principle		
Shielding Design: Linac		
Shielding Design: HDR		
Shielding Design: CT-Sim		
Radiation Survey		
Personnel Monitoring		
Leak Tests		
Institutional Radiation Safety PP		
Transport of Dangerous Goods/Storage/Disposal		

f) Theory and Principles of Treatment Planning

Topic	Date	Signature
Review local treatment planning policies and procedures		
Acceptance Testing and Commissioning of TPS		
Dose Calculation Algorithms		
Beam Modeling		
QA of TPS		
3DCRT Photon Treatment Planning		
Electron Treatment Planning		
Simple IMRT/VMAT Planning		
Image Fusion and Registration		
Informatics: TPS Component		
Secondary Monitor Unit Calculations		
Fetal Dose Calculation		
Pacemakers/Defibrillators		
Hip Implants		

g) Clinical Treatment Planning

Topic	Date	Signature
Palliative		
Head and Neck		
Breast		
Lung		
GU		
Gynaecological		
GI		
CNS		
Stereotactic Radiosurgery		
Total Body Irradiation		
Orthovoltage		
Chart Checking		

h) Brachytherapy

Topic	Date	Signature
Equipment (including imaging systems, QC equipment, and equipment for delivery):		
Permanent Seed Implants		
HDR		
Treatment Planning:		
Dose Calculation Algorithms		
QA and Commissioning		
Clinical Treatment Procedures and Planning:		
Prostate Permanent Seeds (as an example of interstitial implants)		
Prostate HDR		
Gynaecological Brachy		
Intra-luminal Brachytherapy (esophagus, lung)		

i) Case-Based "Applied Physics" Course

Course Passed		

j) "CanMEDS Roles in Clinical Practice" Course

Completed		

Note: This form is for tracking and to facilitate assessment of resident progress by the Associate Program Director and Program Director. The tracking of completion of specific components of a rotation can also aid Clinical Rotation Supervisors when some components of a rotation are covered by other staff members or covered out of order (e.g. if clinical opportunities arise related to commissioning activities).

F – Year 1 Examination

UTDRO Medical Physics Residency Program

Year 1 Exam

1. The Review will be conducted by a minimum of 3 faculty members. One examiner must be the Program Director or a senior physicist from either SOCC or PMH.
2. There will be general radiation oncology physics questions which evaluate the candidate's knowledge of clinical radiation oncology physics. Questions on general Radiation oncology physics will be selected at random from a prepared question bank . The resident's responses could lead to supplementary questions not found in the question bank. The contents of the question bank will be kept confidential and maintained by the Program Director.
3. The residents will be provided the general topic areas for the exam prior to the exam. The exam addresses material from CAMPEP grad school courses that are applicable to radiation oncology physics, completed tutorial/evaluations topics and completed clinical rotations and courses.
4. To pass the Year I oral examination, the resident must achieve an average score of 70%. All scores will be entered into the form Year 1 Examination Scoring Sheet, an example of which is included in this Appendix. If two or more reviewers fail the resident, the resident will receive a failing grade regardless of the other reviewers' scores. If the resident fails the examination they will be not be allowed to re-attempt the examination for 1 months at minimum. A remediation plan will be drafted and reviewed by the PRPC as per program policy.
5. A resident will be notified as soon as possible of the result and this will be confirmed in writing.
6. A resident may request feedback, with respect to the results, from the program director.

UTDRO Physics Residency Program
Year 1 EXAMINATION SCORING SHEET

Candidate:			**Training Site**	
Reviewer :				
Date of Review:				

CATEGORY	MAXIMUM SCORE	SCORE	REMARKS
Dose Measurements/Instrumentation	**10**		
Treatment Plan Evaluation/Review	**10**		
Clinical Question	**10**		
Imaging	**10**		
Radiation Safety and Protection	**10**		
Physics Quantities	**10**		
Radiobiology	**10**		
Linacs/Commissioning/QC	**10**		
Treatment Planning	**10**		
TOTAL SCORE	**/90**		

General Feedback:

____

Signature of Peer Reviewer

____

Date

G – UTDRO Year 2 Final Examination

UTDRO Medical Physics Residency Program

Year 2 Final Exam

1. The Associate Program Director will identify residents that are ready to proceed to the Final Year 2 Oral Examination (all other Program Requirements have been met).
2. Applications to take the UTDRO Final Examination will be submitted by the candidate to the Program Director when requested.
3. An application will include a current curriculum vitae, an abstract of an oral presentation (10-minutes or as defined in instructions from the chair of the exam committee) based on the resident's clinical development project, and copy of completed Master Rotation List and Signature Sheet.
4. The final exam will be conducted by 3 or 4 faculty physicists (including Program Director or a delegate, who will be a senior physicist) and a radiation oncologist. Associate Program Director from resident's training institution, Mentors or Project Supervisors will not be eligible as examiners to ensure no conflict of interest.
5. The exam will consist of an oral presentation (on resident clinical development project) followed by examination of that subject. In addition there will be general radiation oncology physics questions which evaluate the candidate's knowledge of clinical radiation oncology physics.
6. The candidate's interpersonal skills, clinical physics accomplishments, written communication skills and planning and organising ability will be assessed and scored by the candidate's Associate Program Director prior to the examination.
7. The Associate Program Director's assessment will be submitted in writing to the Chair of the examining committee at the time of the examination after the other examiners have completed their scoring.
8. Questions on general radiation oncology physics will be drafted by faculty. Candidate's responses could lead to supplementary questions. The contents of the actual exam will be kept confidential and maintained by the Program Director.
9. To pass the exam the candidate must demonstrate a degree of competence which would indicate that the candidate is able to carry out clinical physics duties safely and effectively with minimum supervision.
10. All scores will be entered into the form UTDRO Final Examination Scoring Sheet, which is included in this Appendix.
11. If two or more reviewers fail the candidate (<70% in Section 1 and 2 as indicated on the form), the candidate will receive a failing grade, regardless of the other reviewers' scores.
12. If the resident fails the examination they must wait 3 months to re-attempt the examination. During this time the resident will be required to follow a remediation plan and will be placed on remediation with probation status. The plan will be reviewed by PRPC as per program policy.
13. A candidate will be notified as soon as possible of the result and this will be confirmed in writing.
14. A candidate may request feedback, with respect to the results, from the Program Director.

UTDRO Medical Physics Residency Program – Final Exam

REVIEWER'S SCORING SHEET

Candidate:	
Reviewer:	
Date of Review:	

Section	**MAXIMUM SCORE**	**CANDIDATE'S SCORE**
1. Clinical Project • Scientific content • Presentation & defense • Abstract at UTDRO Research day?	**5** **12** **3**	**/ 20**
2. Clinical Physics Knowledge • External Beam #1 • External Beam #2 • Brachytherapy • Radiation Protection • Radiobiology • Radiation Oncology #1 • Radiation Oncology #2 • Current issues in RO	**10** **10** **10** **10** **10** **10** **10** **10**	**/ 80**
TOTAL SCORE:	**100**	**/ 100**

3. Local accomplishments (score determined by local coordinator)

a. Review of resident evaluations	**10**	
b. Clinical rotations & projects	**10**	
c. Chart review skills	**10**	
d. Interpersonal skills	**10**	
e. Instrumentation and equipment skills	**10**	**/ 50**

Note: To pass the exam, the candidate must obtain a total score of at least 70 in sections 1 and 2 combined. To be allowed to challenge the exam, the candidate must score at least 40 out of the 50 points in Section 3.

Pass ϒ	Fail ϒ
Signature of Reviewer:	

H – Program Orientation Checklist

PROGRAM ORIENTATION CHECKLIST

Meeting	Date	Signature Completed
Program Overview - provided by Program Director or designate to include:		
1. Program Requirements including: • Policies and Procedures • Book of Forms • Role of Research		
2. Orientation to UT processes and expectations • Access and logins • IDs • Services and support/fees		
3. Administrative Procedures • Badge • TLD		
4. Program schedule		
5. Professional conduct		
Site-Specific Orientation - to be coordinated by the Program Site Coordinator		
1. Key Personnel • Head of Radiation Physics • Radiation Safety Officer		
2. Site-specific orientation		
3. Radiation Safety orientation		
4. WHMIS		
5. Occupational Health		
6. Local Research and Professional Ethics Training		
7. Site specific applications training		

I – Reference UofT Documents

STATEMENT ON PROTECTION OF PERSONAL HEALTH INFORMATION

1. **Jurisdiction:**

This statement applies to all MD Program, postgraduate, graduate professional programs involving patient care, continuing education, medical radiation sciences and physician assistant health professional learners including those registered or participating in educational activities affiliated with the Faculty of Medicine at the University of Toronto. Postgraduate trainees are learners registered through the PGME office as residents (PGYs), fellows, or formal required pre-residency programs.

2. **Background and Rationale:**

This statement sets out requirements to ensure that Personal Health Information[1] (PHI) (in all forms, either hardcopy or digital) in our affiliated teaching sites' custody is properly protected.

- PHI is information about the health or health care of an identifiable individual. An individual is considered to be identifiable if the information outright identifies the person, or if it is reasonably foreseeable in the circumstances that the information could be used (either alone or with other information) to identify the person. Thus, whether information is PHI depends on the context of its use.
- If it is reasonably foreseeable that a person could be re-identified, then the information is considered to be PHI. From the perspective of a custodian such as a hospital, this means that a learner (who is an agent of the hospital) must not disclose the information outside the circle of care unless either the individual consents, or it is not reasonably foreseeable, within the context of the information's use, that the individual could be re-identified.
- Even where information is considered to be de-identified to the point where the patient cannot be re-identified, if context and other information known outside of the circle of care could still be used to re-identify that individual; then that de-identified information would still be considered PHI.
- Access to PHI brings special responsibilities with respect to patient privacy and supporting public confidence in our hospitals, institutions and practices.

Obligations in regard to PHI are set out in Ontario's health information privacy legislation, entitled the Personal Health Information Protection Act, 2004 (PHIPA). PHIPA requires "Health Information Custodians" (HICs) such as hospitals to take reasonable steps to ensure that PHI is protected against theft, loss and unauthorized use or disclosure, and to ensure that records containing PHI are protected against unauthorized copying, modification or disposal. Learners engage in patient care and education involving access to PHI through the affiliation agreements between the University of Toronto and the Hospitals and in other healthcare placements. Under PHIPA Section 37(1) (e), as agents of HICs, such as hospitals, learners are permitted to use PHI. Accordingly, learners are required to be aware of and

[1] As defined in the Personal Health Information Protection Act, 2004 (PHIPA) (https://www.ontario.ca/laws/statute/04p03) includes identifiable information such asma name, address, identifying numbers and other unique characteristics; as well as information for which it is reasonably foreseeable in the circumstances that it could be used with other information to identify an individual.

comply with the HICs' requirements and the HICs are required to make those requirements known to learners.

Learners need access to systems containing PHI in order to provide appropriate clinical service and to fully benefit from their clinical education experience. Learners should only access PHI when doing so is relevant to patient care. Once PHI is no longer required by the learner to provide patient care within a given institution, access should no longer be granted or be made available within that institution. Use or disclosure of material that identifies patients without proper authority constitutes a breach of law and standards of professionalism, privacy and confidentiality that potentially harms patients, the learner, the profession and our organizations. This includes intentionally or unintentionally placing material that identifies patients in the public domain. It is recognized that learners may require access to PHI stored in a secure institutional environment when they are physically outside institutions or, even when mobile within institutions.

Furthermore, it is recognized that learners, being involved in both university and hospital environments, are exposed to varying perspectives on the use of information. Universities by their nature are intended to be open and collaborative where information is encouraged to be shared, and existing university based portals, learning tools or email systems allow this to occur; hospitals are intended to be confidential within the circle of care. University information systems are not designed to support the transmission and storage of PHI and therefore should not be used for this purpose.

Learners must comply with this statement in respect of all formats (including hard copy media, and any form of information technology) that could be used to store or transmit PHI. In the current context, this includes all information and communication equipment such as personal computers, portable storage, networked information and handheld devices, as well as email, text messaging, cloud services, software applications, as well as mobile device applications and or social networking tools.[2]

This statement was developed to provide guidance for the protection of PHI in the context of the HIC as a learning environment.

3. Guiding Principles:

This statement is based on the following foundational principles:

a) Learners need access to PHI to fully benefit from their clinical education and research experience and to provide safe patient care, including at times when they are not physically in the relevant clinical environment.
b) The University and the affiliated hospitals recognize that learners work at multiple sites and are expected to be able to access multiple systems.
c) HICs have a responsibility to provide a data environment that is secure when properly used (a "secure institutional environment"), and to ensure mechanisms are available so learners can continue to provide patient care, if expected of them, outside of the clinical environment.
d) HICs have a responsibility to ensure that their institutional requirements are made available to learners.
e) Learners should not remove PHI from the secure (physical or virtual) central environment provided by the HIC unless there is no other reasonable means to provide safe and expedient

[2] This is not intended to be an exhaustive list.

patient care; and even when using PHI outside the secure central environment, learners must follow HIC policies for secure storage and use of PHI outside that environment.

f) Data used for teaching and/or learning purposes should be de-identified prior to transport out of the HIC's secure institutional environment, and confirmation should be obtained that the data will be accessed only by those needing to do so for those purposes, and that those accessing it will not attempt to re-identify individuals from the data. If identifiable information is necessary for the teaching and/or learning task, then it should be encrypted in accordance with HIC policy.

g) The HIC can disclose health information with the express consent of the patient or substitute decision-maker.

h) In certain circumstances, PHI must be disclosed (i.e. Child Protection, Ministry of Transportation, Health Protection and Promotion Act[3], Public Health).

i) PHI should be handled appropriately within the secure institutional environment. Learners must comply with all PHI and privacy policies and procedures of the HIC with custody of that PHI. When there is no alternative but to remove PHI from a secure institutional environment, the PHI must be fully de-identified, or otherwise fully protected. Hard copy data should not be left unattended; it should be kept hidden from unauthorized viewing, and kept in a locked case when not being used (for example, printed patient lists should be kept in a locked case or securely on the learner's person). Portable equipment used to transport PHI must be properly encrypted and password protected in accordance with HIC policy (for example, if a learner wished to store PHI on a USB key, the key must be encrypted using a HIC-approved method).

j) As professionals, learners must make fully informed decisions that take into account relevant risks and benefits. When faced with decisions regarding use of PHI to affect safe and efficient patient care, learners must consider both the relative risks posed by possible decisions on patient safety and possible breaches of confidentiality with respect to PHI. In the exceptional case where protecting privacy may significantly interfere with patient safety, patient safety must prevail. Specifically, if a HIC reasonably believes that a disclosure of PHI is needed to eliminate or reduce a significant risk of serious bodily harm, it is permitted to make that disclosure, without the consent of the individual to whom the PHI relates.[4]

4. Access to and Authentication and Transmission of Personal Health Information:

Storage of PHI:

- The Information and Privacy Commissioner/Ontario has specifically advised all HICs that PHI must never be stored outside of secure institutional servers unless properly encrypted. PHI should be fully de-identified if held outside the secure institutional servers or networks if it is not encrypted. Electronic devices that are used to access, store, or record PHI, or by which PHI is transmitted must meet HIC-approved standards for information protection. In the current context, this includes: some type of authentication mechanism such as a power-on password, two-factor authentication, locking screen saver etc. to prevent access by unauthorized users, and the ability to encrypt stored and communicated PHI.
- If a learner chooses to use a personal handheld device to manage PHI, the learner must follow the applicable policies of the HIC to ensure that PHI will be sufficiently protected.

[3] https://www.ontario.ca/laws/docs/90h07_e.doc
[4] PHIPA, section 40(1)

- Original hardcopy records must always remain in the secure institutional environment unless HIC policy permits otherwise.

Access to PHI:

- Learners must not access PHI on public access electronic devices or services.
- Using one's institutional login to access one's own personal health information or that of family and friends held within that institution, or networked data, is not typically permitted. Learners wishing to access information in their own personal patient record, must follow the same processes for acquiring access as any other patient would within the relevant institution.
- Access to network data should only be done by those within the direct circle of care.

Transmission of PHI:

- Learners may need to transmit PHI in connection with their clinical care responsibilities and educational needs. PHI must in these cases be protected in accordance with HIC policies. HICs, such as hospitals will provide access to secure methods and systems to support such transmission; provided that such transmission is in accordance with HIC policies. Learners must ensure that all systems and means they expose PHI to be appropriately secured, including, for example, recipient email servers, networks, and storage media. Specific examples in the current context, such as email accounts from Gmail, Hotmail, and Utoronto/UTmail+ are not considered secure for clinical information.

Removal of PHI:

- Learners may need to remove PHI from a secure institutional environment. PHI must in these cases be protected in accordance with HIC policies. Where necessary, HICs will provide HIC-approved equipment or applications, guidance and instructions to assist learners in encrypting data in accordance with their organizational policies.
- When learners take PHI outside of the secure institutional environment for approved purposes of teaching and learning (including at other HICs or in pure learning environments), all reasonable efforts to protect patient confidentiality must be undertaken. Specifically, participants should:
    - obtain the consent of the individuals to whom the PHI relates, if practical; or
    - adopt practices to de-identify PHI in accordance with HIC policy; and
    - ensure there are no patient identifiers associated with presentation materials; and
    - only disclose information that is general enough to preclude re-identification of the individuals ; and
    - ensure that anyone using the information is committed to using it only for the approved purposes and to refraining from attempting to re-identify any individual

5. Reporting:

Learners must report any breach of information privacy or security, or the theft or loss of any device containing or permitting access to PHI immediately to both the educational authority to whom the learner reports and to the institutional HIC Privacy Officer.

6. Implications:

a. Breaches of PHI will be addressed under HIC policies and procedures, and consistent with PHIPA. Breach of any part of this statement may, after appropriate evaluation of the learner and the circumstances of the breach may result in further actions such as education, remediation, probation, dismissal from a course or program or failure to promote. In each case, a range of actions will be considered, and an action appropriate to the particular breach will be applied.[5]

b. This statement does not replace legal or ethical standards defined by organizations or bodies such as the College of Physicians and Surgeons of Ontario, the Canadian Medical Association, the Royal College of Physicians and Surgeons of Canada or the College of Family Physicians of Canada.

c. Action by an assessing body does not preclude action under other University or Institutional policy, or other civil remedies (under statute including PHIPA, the Criminal Code; or civil action).

[Original] Document Approved:
Undergraduate Medical Education Curriculum Committee – July 17, 2012
Physician Assistant Program Management Committee – July 16, 2012
Hospital University Education Committee – November 21, 2012
Postgraduate Medical Education Advisory Committee – November 23, 2012
Faculty Council Education Committee – Dec 6, 2012
Faculty Council – Feb 11, 2013
Hospital University Education Committee – May 17, 2017

[5] For MD Program students, the actions would be considered within the "Standards for grading and promotion of undergraduate medical students" For Postgraduate medical trainees, the actions would be considered within the "Guidelines for the Assessment of Postgraduate Residents of the Faculty of Medicine at the University of Toronto". For Fellows, the actions would be considered within the "Guidelines for Educational Responsibilities in Clinical Fellowships".