MAYO CLINIC
College of Medicine

200 First Street SW
Rochester, Minnesota 55905
507-284-2511

August 20, 2008

Bruce J. Gerbi, Ph.D.
Therapeutic Rad. - Rad. Oncology
University of Minnesota
Mayo Mail Code 494
420 Delaware St SE
Minneapolis, MN 55455

Dear Dr. Gerbi:

We respectfully submit for re-accreditation of our Clinical Medical Physics Residency and Fellowship programs by the Commission on Accreditation of Medical Physics Educational Programs, Inc. We have enclosed the required fee, a CD with a revised self study that reflects the current state of the programs, along with responses to the recommendations brought up during the initial site visit five years ago.

If you require any additional information, please contact us.

Sincerely,

John A. Antolak, Ph.D.
Program Director, Clinical Medical Physics Residency

Michael G. Herman, Ph.D.
Program Director, Clinical Medical Physics Fellowship

Self Study for Accreditation by the

Commission on Accreditation of Medical Physics Education Programs

(CAMPEP, Inc.)

by the

Radiation Oncology Clinical Medical Physics Fellowship Program
Radiation Oncology Clinical Medical Physics Residency Program
Mayo School of Graduate Medical Education
Rochester, Minnesota

Michael G. Herman, Ph.D.
Director, Radiation Oncology Clinical Medical Physics Fellowship Program

John A. Antolak, Ph.D.
Director, Radiation Oncology Clinical Medical Physics Residency Program

Submitted February 2003
Revised April 2003, May 2003, June 2003, June 2004, June 2007, July 2008

I. Program Overview

A. Program Objectives

The Mayo Clinic/Rochester Radiation Oncology Clinical Medical Physics Residency Program is intended to provide training in clinical radiation oncology physics. The targeted applicant will have a Ph.D. and be interested in preparing for a clinically oriented career.

The two major objectives of the program are

- to prepare the graduate for certification in the specialty of Radiation Oncology Physics by an appropriate certification Board, and
- to provide a broad based in depth training that will permit the graduate to immediately contribute to the quality of medical care received by the radiation oncology patient.

Training will take place under the close supervision of experienced radiation oncology physicists. The program emphasizes all areas of training and experience that will be needed by a radiation oncology medical physicist in a "state-of-the-art" treatment facility.

B. Organizational Structure

The Radiation Oncology Clinical Medical Physics Residency program is an official program under the auspices of the Mayo School of Graduate Medical Education (MSGME), the Mayo Foundation entity that is responsible for supervising and administering all residencies at Mayo Rochester. (Attachment 1).

The Department of Radiation Oncology's educational programs come under the aegis of its Education Committee (Paul D. Brown, M.D., Chair). These programs include: (1) Radiation Oncology Residency Program (2.5 per year times 4 years equals 10 medical residents); Radiation Therapy Program within the Mayo School of Health Sciences (1 year RTT program following completion of Radiography program, 5 students per year); the Radiation Oncology Clinical Medical Physics Residency (2 year duration with 2 Mayo funded positions); the Radiation Oncology Clinical Medical Physics Fellowship (3 year duration with 1 Mayo funded up to 3 extramurally funded positions), and pre-doctoral degree programs (M.Sc./Ph.D) through the Mayo Graduate School as well as extramurally funded research postdoctoral programs.

Mayo Clinic/Rochester's Radiation Oncology Department provides services to patients in Rochester (outpatient as well as hospitalized patients), Mankato and Albert Lea, MN. There are a total of 21 staff radiation oncology physicians allocated as follows: Rochester (15); Albert Lea (2); Mankato (2); LaCrosse, WI (1), and Eau Claire, WI (1). Total external beam patient treatments range from 250-315 per day. Brachytherapy and special procedures are provided in Rochester. Many patients are treated as per national protocols including the North Central Cancer Treatment Group (NCCTG) which arose from Mayo initiatives and seeks to provide regional patients with state-of-the-art protocol controlled treatments.

The Radiation Oncology Physics Division includes 21 radiation oncology physicists (12 clinical and 9 faculty), 3 information systems support individuals, 14 dosimetrists (including 1 that specializes in brachytherapy), 1 brachytherapy technician, 1 pre-doctoral student, 3 postdoctoral fellows and 2 medical physics residents. They provide clinical, educational and development services for Mayo Rochester as well as all of the regional practices.

The physics residents and fellows have the same access to all personnel, equipment and institutional resources available to any member of the physics staff.

Statements of support for Accreditation of the Mayo/Rochester Radiation Oncology Clinical Medical Physics Residency are included (Attachment 2).

C. History of Program

The Radiation Oncology Clinical Medical Physics Residency at Mayo Rochester began under the direction of Dr. Edwin McCullough in the Fall 1996 when Helen L. Liu finished her Ph.D. and wanted to do a clinical residency. At the time, due to contraction of the Radiation Oncology medical residency numbers, a conversion was made to establish a permanent medical physics residency slot. In 1998 and 2001, the second and third resident entered the program. A second permanent position was approved in November 2002. Attachment 3 lists details of past and present radiation oncology physics residents.

There is strong support of the Radiation Oncology Physics Residency and Fellowship programs as demonstrated by three permanent Institutionally funded positions (2 resident and 1 fellow).

II. Training Requirements

A. Elements of Clinical Training

The clinical training is designed to cover the major training for Radiation Oncology Physics as outlined in AAPM Report No. 90, "Essentials and Guidelines for Hospital-Based Medical Physics Residency Training Programs."

The two year program consists of activities in four distinct areas:

- Obtaining skills in the technical aspects of radiation oncology radiation physics, e.g., dosimetric systems, equipment acceptance testing and commissioning,
- Support for all clinical obligations including treatment planning, special procedures, equipment quality assurance and safety,
- Didactic instruction in anatomy, radiation oncology, radiation biology as well as radiation oncology physics, imaging physics and,
- Participation in the introduction of new technologies (as time permits and is appropriate).

The program requires teaching and seminar presentation. These include teaching 3-4 lectures per year in the radiation therapy technologist training program, teaching 1-2 lectures per year in the medical resident physics program and being a teaching assistant for either the radiation physics graduate course or the radiation oncology physics graduate course.

The training program structures the two year experience (Attachment 5) into one-on-one mentored time and rotations which are designed to provide clinical training and produce a series of informal documents that are evaluated by the graduate faculty through quarterly meetings and an oral exam at the completion of each rotation. Objectives for rotations exist (Attachment 6) and are presented to the trainees along with Attachment 5 during Resident Orientation. Throughout the program, the residents rotate with medical physicists for evaluated clinical experience. As the resident moves through the structured training in each major category, a number of activities may be going on in parallel. This is done to best suit the needs of the

individual resident and to coincide with major clinical activities going on, such as machine installation and commissioning.

B. Didactic Education

The one-on-one mentoring structure offers an excellent opportunity for intimate education with very seasoned experts. In terms of formal courses, the Residents who have graduated from medical physics degree programs are encouraged to attend the didactic courses listed. The residents who have not been degreed in a medical physics graduate program are required to take these courses:

- Anatomy for Therapy Students – Offered annually, given by anatomy instructor, one or two semester course. (contact Leila Bussman-Yeakel)
- Radiation Biology – offered bi-annually, two week intensive course with a consultant expert radiobiologist. (scheduled with Medical residency program director)
- Radiation Oncology Physics for residents – year long course taught to medical and physics residents by the medical physics faculty.
- Radiation Oncology physics Graduate level course BME8152, when offered is an optional course. Much of this is learned during mentored rotations.
- BME 8150 – basic radiological physics, when offered is an optional course.
- Clinical Radiation Oncology– annual two semester course taught by our clinical M.D. staff in a site specific manner in the radiation therapist training program. (contact Leila Bussman Yeakel)
- Oncology Core curriculum - A weekly lecture primarily for medical residents. The physics resident should attend those sessions specific to radiation oncology.
- Imaging physics for Radiology residents. Course includes basic physics for each imaging modality. (contact Cynthia McCollough or Beth Schueller)

The “official” texts for the overall residency are Khan’s “Physics of Radiation Oncology” and Van Dyk (Editor) “The Modern Technology of Radiation Oncology, Volumes 1 and 2” and these books are provided to each resident.

C. Participation in Conferences and Journal Club

The Department of Radiation Oncology, like most major departments, has available regularly scheduled seminars and conferences which the residents attend. These include:

- Radiation Oncology Subspecialty Conference (journal club) is 1/month. The residents will attend this meeting a minimum of 8 times per year.
- Medical Physics Journal club is held every two months. Under the mentorship of the medical physics faculty, physics residents/fellows will present an article in journal club. The trainees will attend all of these.
- Monday Morning QA conference – this treatment planning conference is an essential conference and should be attended at least 3x per month.
- Thursday new patient conference – attend 2x per month

- Friday morbidity and mortality conference – 1 month
- Physics Division and dosimetry meetings – 1-2x per month.
- Visiting professor lectures in both radiation Oncology and Radiation physics

III. Residents

A. Admissions

The Radiation Oncology Physics Residency/Fellowship applicants must demonstrate having achieved a high level of knowledge of physics documented by having earned a Ph.D. degree in medical physics, physics or another appropriate physical science (most likely biomedical engineering).

The application process in available on-line through the Mayo School of Graduate Medical Education (mayo.edu). All application material and program description is available on-line and included in Attachment 7.

When an application is considered complete (including letters of recommendations and transcripts of graduate school work) by the Mayo School of Graduate Medical Education, it is forwarded to the Radiation Oncology Clinical Medical Physics Residency Director and reviewed by members of the Radiation Oncology Clinical Medical Physics Education Executive Committee (Attachment 8). Depending on the number of positions to be filled in a given year, up to 9 candidates are invited to come to Rochester for an interview. An example interview itinerary is shown in Attachment 9. The Program Director spends 60 minutes reviewing Mayo and the Program. Each applicant presents a talk to the faculty/staff. The interview committee (Attachment 8) does a minimum one-half hour interview and ranks the candidates. Evaluation is done using a standardized form (Attachment 10) and filled out by each member of the Interview Committee. On the day of the interview each candidate meets with the Department Chair and has lunch with current and/or past residents, if possible.

At the completion of the interview process, the Medical Physics Executive Committee meets to decide on offers. Positions are offered to the top candidate(s). The candidate is given an "acceptance by" date. When the position is filled, the remaining candidates are notified. Our policy is to tell forthrightly all candidates where they ranked. Upon acceptance a recommendation is forwarded to the Mayo School of Graduate Medical Education who reviews the material and issues the official commitment (Attachment 11).

Resident selection is done consistent with the Mayo School of Graduate Medical Education stated policy, i.e., "Programs must select from among eligible applicants on the basis of their preparedness, ability, aptitude, academic credentials, communication skills, and personal qualities such as motivation and integrity. Programs must not discriminate with regard to sex, race, age, religion, color, national origin, disability, or veteran status".

B. Recruitment Efforts

Recruitment is done utilizing an ad in the AAPM Placement Bulletin (Attachment 12) and the AIP website. Both of these are accessible to any and all interested applicants. The Mayo School of Graduate Medical Education website has the Radiation Oncology Clinical Medical Physics Residency and Clinical Medical Physics Fellowship listed (Attachment 13). A third way of publicizing the Program has been to write letters to pre-doctoral Medical Physics Program Directors.

C. Number of Residents

The Clinical Medical Physics Residency has two Mayo Foundation funded positions, and the intent is to have overlapping two year residencies. Mayo Foundation also provides funding for one Clinical Medical Physics Fellowship. In addition, funding from industrial sources may be used to fund up to 3 additional fellowships. As of July 2008, the program enrollment includes two residents and four fellows (see Attachment 3 for a list of current and past residents).

D. Evaluation of Resident Progress

Residents are evaluated in a number of ways. The primary mentor (faculty advisor) meets one-on-one at least twice per month (once per week is encouraged) to help the resident focus and evaluate their progress. These are informal one-hour meetings which are very useful in providing guidance (at the beginning) and praise/criticism as the residency progresses.

Major written evaluations occur:

- At the completion of a rotation, a written report and/or a slide presentation is prepared by the resident to document the rotation experience. The detailed documentation for completing a section is the final approved report plus the oral exam evaluation (Attachment 14). When the primary mentor is satisfied and the data/presentation is considered complete, the resident defends the rotation in an oral exam by the program faculty. For some rotations, allied health personnel familiar with the resident's performance in the rotation are also asked to participate in the examination. The result of the oral exam (satisfactory or not satisfactory) is indicated on the oral evaluation form (Attachment 14) along with relevant comments. If additional work is required (not satisfactory result), it is documented. Depending on the amount of work required, another examination may or may not be required (at the discretion of the examination committee) to eliminate the deficiency.
- A quarterly evaluation form is submitted to the Mayo School of Graduate Medical Education (Attachment 15) following a 1-1.5 hour oral quarterly review. Recently completed and current rotations, as well as didactic courses are listed. For fellows, research performance is also evaluated. The resident is assigned a score of satisfactory, unsatisfactory, or unable to evaluate in several different categories, as shown on the form. Any area that is considered unsatisfactory is discussed with the resident. The resident, faculty mentor, and program director sign the quarterly evaluation form, which is then forwarded to the Mayo School of Graduate Medical Education.
- When credentialing to practice a procedure independently in the clinic. It is our policy not to allow persons to perform clinically significant duties without some documentation of competence. This is done through a process of credentialing in which a group of senior physics section members examine the candidate with the goal of determining competency to carry out the technical necessities as well as understanding their basis. This is independent of, but may be in parallel to completing a rotation.
- The Education Executive Committee meets approximately once per month. Faculty mentors summarize current progress for each resident, which is recorded in the minutes. Education Executive committee members are also encouraged to make comments regarding observations of and interactions with the residents.
- During written testing associated with didactic courses (as deemed necessary)

The Program Director reviews these evaluations with the resident. Unsatisfactory performance is usually designated "heightened awareness" but will be followed with the designation Probation if performance does not substantially improve before the next quarterly evaluation. This is consistent with the MSGME Policies (Attachment 16) and the MSGME Probation and Dismissal Policy (Attachment 17).

At the end of each rotation, the resident is asked (by the educational coordinator) to submit an evaluation form regarding the rotation (Attachment 18). Filling in the form is voluntary, and forms can be printed or submitted via email to Dr. Y.I. (Nina) Garces, who assists the program by tabulating the results and attempting to assure anonymity of the responses. Results are forwarded to the program executive committee on an annual basis in time for the annual program evaluation, which occurs in mid to late June of each year.

An annual evaluation of the program by the residents is carried out each year (late May), just prior to the arrival of new incoming residents and fellows at the beginning of July. Residents and fellows are asked (by the educational coordinator) to submit an evaluation form (Attachment 19). Filling in the form is voluntary, and forms can be printed or submitted via email to Dr. Y.I. (Nina) Garces, who assists the program by tabulating the results and attempting to assure anonymity of the responses. Results are forwarded to the program executive committee on an annual basis in time for the annual program evaluation, which occurs in mid to late June of each year.

E. New Resident Orientation

All Mayo School of Graduate Medical Education residents and fellows receive a brief orientation which covers many of the aspects of their appointment including an overview of Policies for Residents (Attachment 16). Within the Radiation Oncology Clinical Medical Physics programs, the program director spends some time with the trainees outlining the program and expectations during a formal orientation (Attachment 20). Also, a series of operational aspects (library card, LAN ID, film badges, access cards) are simultaneously carried out. Film badge issuance includes a radiation safety overview.

IV. Program Administration

A. Structure Within the Hospital or Medical Center

Residents and fellows are appointed by the Mayo School of Graduate Medical Education and are governed by all rules and regulations that apply to all medical residents (Attachment 16 and Attachment 17). Their stipends, benefits and absences are identical to that of medical residencies (Attachment 21).

The Radiation Oncology Clinical Medical Physics Residency Program Director was Edwin C. McCullough, Ph.D. through Dec 2002 and it transferred to Michael G. Herman, Ph.D. in January 2003 in anticipation of accreditation and Doctor McCullough's role in CAMPEP. In January 2007, John A. Antolak, Ph.D. took on responsibility for directing the residency education program (Dr. Herman is still the director of the fellowship program). The Program Directors are responsible to the Department's Education Director (Paul D. Brown, M.D., who also serves as Program Medical Director) who is responsible through the Department Chair (Paula J. Schomberg, M.D.) to the Mayo School of Graduate Medical Education (Attachment 1). Program administration is the responsibility of the Program Directors (J. A. Antolak, Ph.D. and M. G.

Herman, Ph.D.) and the Clinical Medical Physics Education Executive Committee (Attachment 8).

The Mayo School of Graduate Medical Education routinely conducts audits of all their accredited programs at a point halfway through the period for which accreditation was granted. This is conducted by an experienced group of internal examiners and will meet the very high standards associated with large academic medical centers with many ACGME programs.

B. Role of the Program Director

The Program Director is responsible to all reporting entities to conduct the program in accordance with all Mayo Foundation expectations. Furthermore, he/she is responsible for ensuring all locally established guidelines are adhered to. The resident's experience must conform to the training plan and it is the Program Director's responsibility to ensure that all aspects of training are given and that the expected level of competencies is achieved by completion.

C. Committees and Meetings

Committees associated with the Radiation Oncology Clinical Medical Physics Residency/Fellowship (Attachment 8) are: (1) Admissions Committee and (2) Education Executive Committee. The Admissions Committee includes all members of the Education Executive Committee as well as Dr. Paul D. Brown (Program Medical Director and Chair, Department of Radiation Oncology Education Committee) and a second Radiation Oncologist. The Admissions Committee meets as needed, usually during the first quarter of the calendar year when interviews are scheduled. The Education Executive Committee conducts business (and keeps minutes) as part of a monthly meeting of the Medical Physics faculty.

D. Records Available for Review

The Applicant Program will generate and maintain the following records:

1. Medical Physics Education Executive Committee Minutes
    - administrative activities
    - applicant selection activities
    - oral examination activities and results
2. Residents
    - training schedule
    - rotation evaluations
    - examination results
    - oral examination evaluations
3. Resident applications
    - application forms
    - transcripts (prior work)
    - references

- candidate interview evaluations

Records in categories 1 and 2 will reside in the Program Director's office. Records in category 3 will be maintained exclusively in the Mayo School of Graduate Medical Education (Siebens 5) with access governed by the rules of Mayo Foundation.

V. Resources

A. Financial

The Mayo Rochester's Radiation Oncology Clinical Medical Physics Residency is funded by Mayo Foundation as an ongoing commitment. We do not anticipate any problems with continuing indefinitely with three positions (two residents and one fellow) as long as the program can attract qualified candidates. We have also been successful in obtaining industry funding for additional fellows over the past several years.

The current stipend for the resident is $46,063 and $47,907 for the first and second years respectively. In addition to direct compensation the physics residents are afforded all benefits and absences identical to the medical residents (Attachment 21). It is Mayo School of Graduate Medical Education's policy to support one professional trip during the residency and the Department will support additional trips for professional presentations. The Department pays for a junior membership in AAPM.

The Institution has a variety of support services available (Attachment 21).

B. Staff

The Medical Physics Division members are deeply committed to this program. All of the Education Executive Committee Members have appointments in the Mayo School of Graduate Medical Education and the three senior members (Herman, Kline and Antolak) have graduate privileges in the Biomedical Engineering Program of the Mayo Graduate School (MSc and PhD programs). All clinical physics staff are expected to participate in the education of the Residents. Resident offices are proximal to the clinical physics staff offices and the physics lab.

Attachment 22 lists the faculty which includes Ph.D. Faculty, clinical medical physics staff and Dosimetry supervisor. Attachment 23 contains individual Biographies of the associated faculty. Also, it needs to be realized and acknowledged that all members of the Department contribute in significant ways to the cumulative education of the resident. This is especially true in the horizontal work group atmosphere here at Mayo.

Physics section staff members are always accessible and available to discuss issues with the resident. In general, there is a faculty-to- resident ratio of at least 2:1.

C. Resident Offices, Class Rooms and Conference Rooms

Each resident has an office area located within the Radiation Oncology Department. They are provided with a computer (with Microsoft Office Suite) with network connections, a Mayo email account, storage, telephone, pager and office supplies. They have access to a departmental copying machine. The Educational Coordinator (currently Elaine Eckheart) is available to assist them in any way possible including submitting paperwork for absences and trips. The resident's offices are new, clean, quiet and equipped with modern office furniture. The office is shared with pre- and postdoctoral students and is located in near proximity to the clinical physicists and the physics lab.

The Department has three areas for conferences and teaching. All of these are equipped for data projection from networked computers. All meeting rooms meet the highest standards in equipment.

D. Clinical Facilities, Laboratories and Shops

The Department has a small physics "lab" for dosimetry equipment storage and use (150 sq. ft.), a small repair shop (66 sq. ft.) as well as a large cerro block/MLC shaper design shop (500 sq. ft.). Mayo support is highly centralized so machine shop and machine engineering is done outside the footprint of the Department.

The Department has all the latest state-of-the-art dosimetric equipment, phantoms, etc. (Attachment 24). Residents have access to all equipment and are expected not to use the equipment unless properly trained. They are also expected to leave all equipment in a clinical ready mode when done.

E. Libraries

The Department of Radiation Oncology has a library with some physics references. The resident has access to the Mayo Library at the same level as any other Mayo professional. This includes access to electronic versions of many journals as well as various searching mechanisms (e.g. Medline). The Mayo Rochester Libraries are several in number and the catalog shows all holdings. Interlibrary loans as well as translation services are available.

F. Publication/Presentation Support

Mayo Clinic has had a long record of encouraging publication. The Section of Publications offers services in support of manuscript preparation. Additionally, the Section of Visual Communications offers graphic support as well as poster design, integration and fabrication. The Department of Radiation Oncology will support use of these services as needed and appropriate.

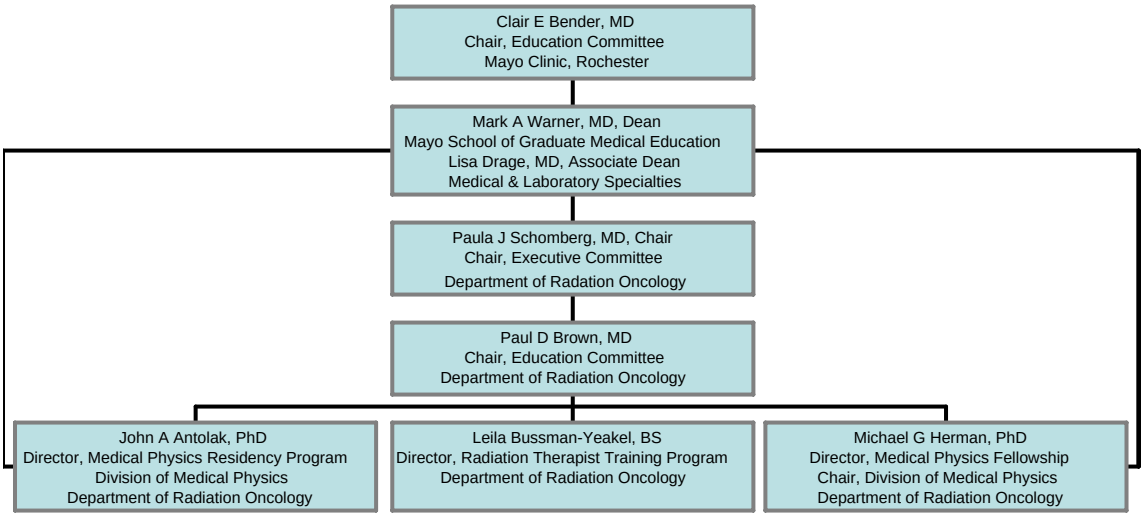
G. Safety

It is the Mayo policy to provide a safe working environment for its employees and educational program participants. Mandatory training in infectious disease control as well as hazardous situation (tornado, fire, blizzards) are carried out. In addition, film badges are issued, which is accompanied by a radiation safety briefing. Further, yearly radiation safety courses are conducted and the residents are required to attend. Machine and electrical safety are a concern of all entrusted with the training of the Radiation Oncology resident. Mayo is accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and, as such, meet all there standards for safety of individuals.

VI. List of Attachments

Attachment 1. Program Supervision and Reporting Structure

Clinical Medical Physics Residency & Fellowship Programs
Program Supervision and Reporting Structure



Attachment 2. Letters of Support from Department and Institution

MAYO CLINIC

200 First Street SW
Rochester, Minnesota 55905
507-284-2511

Radiation Oncology

March 13, 2008

CAMPEP, Inc.
One Physics Ellipse
College Park, MD 20740

To Whom It May Concern:

The Administrative and Educational Leadership in the Department of Radiation Oncology at Mayo Clinic Rochester supports this application for continued accreditation of our Radiation Oncology Clinical Medical Physics Residency. Since its inception, we have encouraged its existence and excellence.

We feel this program compliments our education mission and we are highly desirous that it continue the designation "Accredited by CAMPEP, Inc." as an assurance that the program has achieved the level of excellence we strive for.

Sincerely,

Paul D. Brown, M.D.
Chair, Education Committee

Paula J. Schomberg, M.D.
Chair, Department of Radiation Oncology

MAYO CLINIC
College of Medicine

200 First Street SW
Rochester, Minnesota 55905
507-284-2220

**Mayo School of
Graduate Medical Education**

March 24, 2008

Bruce J. Gerbi, Ph.D.
Chair, CAMPEP REPRC
Therapeutic Rad. - Rad. Oncology
University of Minnesota
Mayo Mail Code 494
420 Delaware St SE
Minneapolis , MN 55455

Dear Dr. Gerbi,

We formally invite the Commission on Accreditation of Medical Physics Education Programs, Inc. (CAMPEP) to visit and review the Mayo School of Graduate Medical Education Radiation Oncology Physics Residency and Fellowship Programs for the purpose of renewing the CAMPEP accreditation. Attached you will find the self-study prepared by Drs. John Antolak and Michael Herman, the program directors.

The Mayo Graduate School of Medicine takes responsibility for the creation, implementation, and ongoing quality maintenance of graduate medical education training programs. We require that all of our residency and fellow training programs that are eligible be accredited. We applaud your efforts to set standards for quality training in medical physics programs and are willing to assist you in whatever you need to review the Mayo Radiation Oncology Physics program. Please let us know if we can help any further.

Sincerely,

Mark A. Warner, M.D., Dean
Mayo Clinic College of Medicine
Mayo School of Graduate Medical Education

Lisa A. Drage, M.D.
Associate Dean, Medical and Laboratory Specialties
Mayo School of Graduate Medical Education

Rochester, Minnesota
507-284-2220

Jacksonville, Florida
904-953-0425

Scottsdale, Arizona
480-301-8480

Attachment 3. Accreditation Certificates

Mayo Clinic Rochester
Rochester, MN

has been Accredited by the

Joint Commission
on Accreditation of Healthcare Organizations

Which has surveyed this organization and
found it to meet the requirements for accreditation.

2005-2008

Fred L. Brown
Chairman of the Board of Commissioners

409474
Organization ID #

Dennis S. O'Leary, M.D.
President

The Joint Commission on Accreditation of Healthcare Organizations is an independent, not-for-profit, national body that oversees the safety and quality of health care and other services provided in accredited organizations. Information about accredited organizations may be provided directly to the Joint Commission at 1-800-994-6610. Information regarding accreditation and the accreditation performance of individual organizations can be obtained through the Joint Commission's web site at www.jcaho.org.

Rochester Methodist Hospital

Rochester, MN

has been Accredited by the

Joint Commission

on Accreditation of Healthcare Organizations

Which has surveyed this organization and
found it to meet the requirements for accreditation.

2005-2008

Fred L. Brown
Chairman of the Board of Commissioners

Dennis S. O'Leary, M.D.
President

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Saint Marys Hospital

Rochester, MN

has been Accredited by the

Joint Commission

on Accreditation of Healthcare Organizations

Which has surveyed this organization and
found it to meet the requirements for accreditation.

2005-2008

Fred L. Brown
Chairman of the Board of Commissioners

Dennis S. O'Leary, M.D.
President

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Mayo Psychiatry and Psychology Treatment Center

Rochester, MN

has been Accredited by the

Joint Commission

on Accreditation of Healthcare Organizations

Which has surveyed this organization and
found it to meet the requirements for accreditation.

2005-2008

Fred L. Brown
Chairman of the Board of Commissioners

Dennis S. O'Leary, M.D.
President

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Attachment 4. Data on Clinical Medical Physics Residents and Fellows Trained/Training to Date

I. Residents

Name:	Nataliya Kovalchuk, Ph.D.
Start Date:	July 2008
Graduation:	June 2010
Present Status:	Resident in good standing
Phone:	507-284-3261
Email:	kovalchuk.nataliya@mayo.edu
Certification:	

Name:	Chris Deufel, Ph.D.
Start Date:	July 2007
Graduation:	January 2010
Present Status:	Resident in good standing, graduation delayed due to extended illness
Phone:	507-284-3261
Email:	deufel.christopher@mayo.edu
Certification:	

Name:	Stephen T. Ratliff, Ph.D.
Start Date:	July 2006
Graduation:	June 2008
Present Status:	Associate Professor of Physics St. Cloud State University 1708 Red Fox Road (home) St. Cloud , MN 56301-7900
Phone:	507-284-3261
Email:	steven@stevenratliff.com
Certification:	

Name:	Houssam Abou Mourad, Ph.D.
Start Date:	July 2005
Graduation:	January 2007
Present Status:	Radiation Oncology Mayo Clinic 1025 Marsh Street, P. O. Box 8673 Mankato , MN 56002
Phone:	507-345-2960
Email:	AbouMourad.Houssam@mayo.edu
Certification:	In progress

Name:	Carmen R. Kmety-Stevenson, Ph.D.
Start Date:	July 2004
Graduation:	June 2006
Present Status:	10504 Indian Ridge Dr Fort Wayne , IN 46814
Phone:	260-436-4116
Email:	Carmen.Kmety-Stevenson@nchmd.org
Certification:	ABR (2008)

Name:	Tsegeye Tekale, Ph.D.
Start Date:	July 2003
Graduation:	Dismissed from program, 2004

Name:	Christopher R. Hagness, Ph.D.
Start Date:	November 2002
Graduation:	October 2004
Present Status:	Medical Physicist University of MN Medical School 4502 Oak Dr. (home) Edina , MN 55424
Phone:	319-272-2837
Email:	christopher.hagness@wfhc.org
Certification:	ABR (2006)

Name:	Varun Sehgal, Ph.D.
Start Date:	July 2001
Graduation:	Withdrew from Program
Present Status:	Department of Radiation Oncology University Of California, Irvine UCI Medical Center Bldg 23 101 The City Drive Orange , CA 92868
Phone:	714-456-8093
Email:	varun.sehgal@uci.edu
Certification:	ABR (year unknown)

Name:	Debra H. Brinkmann, Ph.D.
Start Date:	August 1998
Graduation:	July 2000
Present Status:	Department of Radiation Oncology Mayo Clinic/Rochester 200 First Street, SW Rochester, Minnesota 55905
Phone:	507-284-3551
Email:	brinkmann.debra@mayo.edu
Certification:	ABR (2002)

Name:	Helen H. Liu, Ph.D.
Start Date:	September 1996
Graduation:	May 1998
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Attachment 5. Rotation and Report Structure and Sample Radiation Oncology Clinical Medical Physics Resident Schedule

I. Rotation Outline and Structure

Most rotations follow three essential phases of mentoring.

- The first phase is initial teaching, discussion and reading with observation and explicit instruction on why, how, what and attention to making sure the resident understands the fundamental aspects of the current rotation. Routine discussions with the rotation mentor and primary mentor will occur.
- Engaged in the rotation, but closely supervised, the resident will work hand in hand with the mentor, performing the tasks under direct supervision. This phase develops the confidence in the rotation.
- During the final phase of each rotation the resident will perform the duties as a medical physicist would be expected, using the mentor as a consultant for questions.

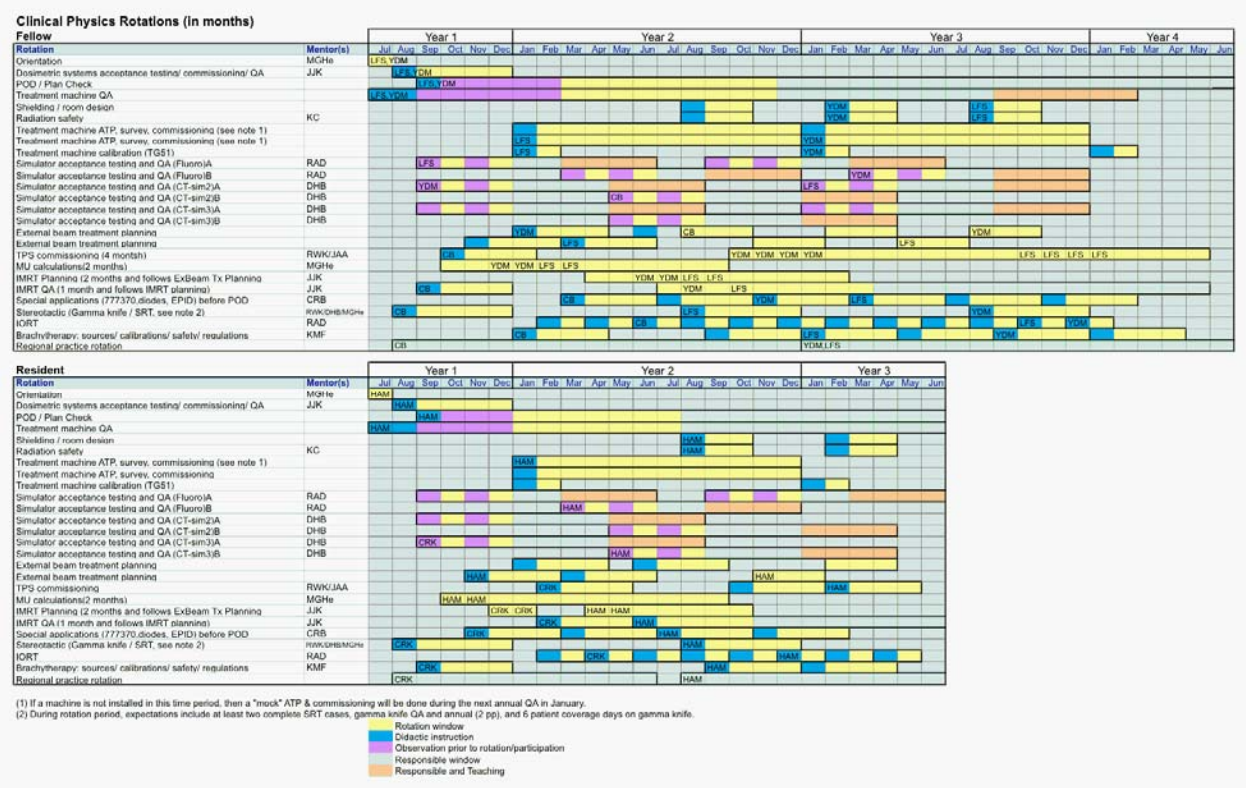
Evaluations occur informally and routinely by the mentor and formally at quarterly and rotation oral exams as described earlier.

II. Report Structure and Oral Evaluation

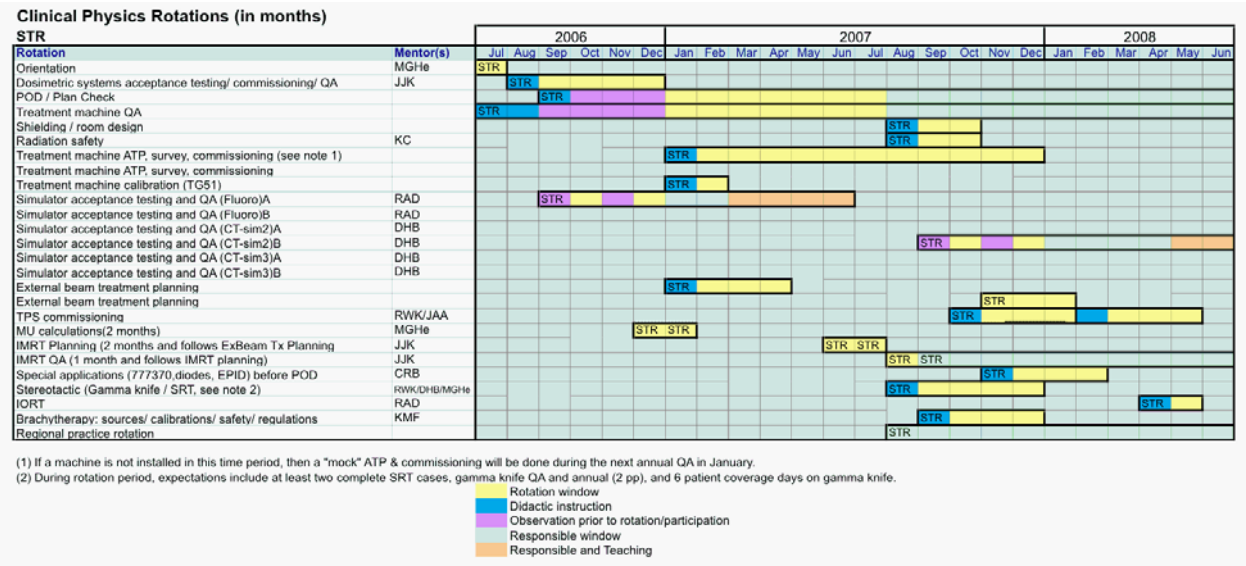
Each resident will maintain a log book, where activities will be logged. These will be discussed and reviewed with the primary mentor during weekly meetings. In addition, a presentation, outlining the material covered in a given rotation will be prepared and defended by the resident by the end of a rotation. It is expected that the resident does understand the material outlined, without necessarily documenting every detail in the presentation. The resident will deliver a short (approximately 30-minute) talk on the topic of the rotation as part of the 1.5-2 hour oral exam by the Medical Physics Faculty members.

III. Master Rotation Table Example

The following picture shows an example master schedule (for all residents and fellows). This is done at the beginning of each academic year (July) to schedule all rotations for incoming residents. Rotations for existing residents and fellows are included to ensure that rotations are not double-booked.



The following picture shows the clinical rotation schedule for a single resident, and this is given to the resident after they start the program. The schedule may be modified as the resident continues in the program; however, it is useful for the resident to know what they might need to be preparing for. The fellows have all of the same rotations, except that they are spread out over three years, to allow for concurrent research activity.



Attachment 6. Rotation Objectives for the Radiation Oncology Clinical Medical Physics Residency

I. General Objectives

1. Resident is expected to become competent in all areas related to the safe and efficacious use of ionizing radiation as relates to simulation, planning and treatment of human disease; This is accomplished in part through routine evaluated clinical rotations.
2. Resident is expected to complete structured rotations that include written summaries/reports at the completion of the rotation. Evaluations will occur throughout each rotation in one to one and group settings.
3. Resident will present, review and defend his/her knowledge of a given rotation in an oral-based session with the residency program faculty.
4. Mayo School of Graduate Medical Education quarterly grades will be based on the results of ongoing evaluations and rotation end oral evaluations.
5. Resident is expected to obtain an appropriate mastery of the physical principles (e.g. interactions of radiation in matter, radionuclidic decay therapy) associated with the use of radiation in treatment of human malignancy.
6. Resident is responsible for obtaining a level of training in anatomy, computer technology and diagnostic imaging appropriate for a position as a Radiation Oncology Clinical Physicist. This is primarily accomplished during the clinical dosimetric treatment planning rotation and didactic courses on these topics.
7. Resident will demonstrate knowledge sufficient to ensure she/he can manage the radiation safety aspects of a Radiation Oncology practice.
8. Resident is expected to attend Radiation Oncology Department conferences and Radiation Physics Division meetings and journal club.
9. Resident will understand the potential uses of and hazards associated with ionizing radiation and high voltage electronics as used in the practice of radiation oncology.
10. Radiobiological principles of the use of radiation will be understood by the resident, through both didactic and practical training.

II. Dosimetric Systems

A. Ion Chamber

1. Principles of operation: Resident will be able to describe the theory of operation of an electrometer/ion chamber system. (references: Khan – Physics of Radiation Therapy and Van Dyk – The Modern Technology of Radiation Oncology)
2. Uses of cylindrical and parallel plate ion chambers: Resident will learn which tasks are appropriate for various detectors. Detector geometry and size are to be considered
3. Calibration: Resident will be able to describe the various correction factors required to use an ion chamber as an absolute dosimeter. (references: Khan, Van Dyk, TG21 and TG51)

4. Commissioning measurements: Resident will perform commissioning measurements to parameterize the operation of a cylindrical ion chamber. The resident will develop a list of measurements, perform them, and present and interpret the data.

B. Film

1. Principles of operation: Resident will be able to describe the process by which an image is formed on a film, and explain how the system can be used as a dosimeter. (references: Khan – Physics of Radiation Therapy and Van Dyk – The Modern Technology of Radiation Oncology)
2. Applications of film: Resident will be able to describe various clinical applications for which film is well suited (and for which it's inappropriate). The discussion will include films of various sensitivities and Gafchromic film.
3. Measurements: Resident will be familiar with methods for converting grey scale film images into dose maps. The Vidar scanner and RIT software will be used to create an H&D curve and measure a dose distribution with film.

C. Diodes

1. Principles of operation: Resident will be able to describe the theory of operation of a diode system. (references: Khan – Physics of Radiation Therapy and Van Dyk – The Modern Technology of Radiation Oncology)
2. Applications: Resident will describe clinical application of photon and electron diodes.
3. Measurements: Resident will calibrate a photon and an electron diode. Other effects such as temperature and energy dependence will also be measured and described.

D. TLD

1. Principles of operation: Resident will be able to describe the theory of operation of TLD. (references: Khan – Physics of Radiation Therapy and Van Dyk – The Modern Technology of Radiation Oncology)

III. POD and Plan Check

Physicist of the Day (POD) and PlanCheck are currently scheduled as separate clinical duties; however, the resident/fellow may be examined on both at the same time. Therefore, for the purposes of training, they are considered to be part of the same rotation. In the clinic, POD and PlanCheck are usually expected to be able to cover for each other (e.g., lunch coverage, meetings).

A. POD

1. The POD is the on-call physicist from 7:00 am – 5:00 pm. During the rotation, the resident will be assigned to shadow the POD for an entire day. The resident may be excused for a short period of time if there is a conflict (e.g., resident needs to go to a lecture). However, if the resident knows that there will be several conflicts, they should reschedule their POD training day. As the resident becomes more familiar with POD duties, the resident may be asked to carry the POD pager.
2. One of the primary responsibilities of the POD is to be available to help fix hardware and software problems (linear accelerators, simulators, planning systems, and associated computers) in the clinic. Therapists and dosimetrists will call the POD using

priority pager 82136, and the POD is expected to answer the pager during this time period and coordinate fixing the problem. In some cases, the POD may be able to fix the problem themselves; in other cases, the POD may have to ask for assistance. If the POD calls for assistance (e.g., from x-ray maintenance), the POD should remain on the scene (unless called elsewhere) until the problem has been resolved. A complete list of POD responsibilities can be found in the physics documentation ("Reference Documents" in the Physics folder on the department shared drive).

3. The POD is responsible for signing off on the morning QA that is done on each treatment machine and simulator. The morning QA is recorded electronically using the Argus QA software. The resident should have previously observed morning QA during some of the introductory labs and rotations, so they should be familiar with the tests that are done. The resident should become familiar with the different action levels for the QA tests, and know what needs to be done if a test result is outside of the normal tolerance.

4. The POD is responsible for the weekly chart check for a subset of the patients on treatment. The resident will be shown how to determine what subset of patient charts need to be checked, and how the results of the chart check are recorded. The POD physicist will review the chart check procedure with the resident, and the resident will be asked to independently review a sample of the treatment charts for a given day. If the resident finds a problem or sees something unfamiliar in the chart, the resident will discuss this with the POD before any action is taken. The POD is responsible to independently checking the treatment chart and reviewing any additional findings with the resident.

5. The POD is not expected to be able to fix all problems that they may be called about. However, they should be able to fix some of the more common problems, and know where to look to find answers to less common problems (e.g., documents on department shared drive, Mayo-Trac). They can also call on other physicists or the vendor to help if needed.

B. PlanCheck

1. The PlanCheck physicist is responsible for checking treatment plans coming out of dosimetry on a given day. It is standard procedure that all treatment plans are to be signed off by a physicist prior to the patient's first treatment. On any given day, all plans that are completed by dosimetry prior to 4:00 pm are the responsibility of the PlanCheck physicist. During the rotation, the resident will be assigned to shadow the PlanCheck physicist for an entire day. The resident may be excused for a short period of time if there is a conflict (e.g., resident needs to go to a lecture). However, if the resident knows that there will be several conflicts, they should reschedule their PlanCheck training day.

2. When the resident is first scheduled for PlanCheck, they will most likely not have had their external beam treatment planning rotation. Therefore, much of the treatment planning output will be unfamiliar. The PlanCheck physicist and the resident should go through are least one treatment plan together, with the PlanCheck physicist going through all of the items that need to be checked. The resident should become familiar with the current PlanCheck checklist (found in the physics documentation) and how to log errors that are found. After going through one or two plans, the PlanCheck physicist

will choose a treatment plan that they feel the resident can handle and get the resident to go through the plan, using the checklist as a guide. After discussing their findings with the PlanCheck physicist, the PlanCheck physicist will independently check the treatment plan and discuss any differences in findings with the resident.

3. As the resident advances in the rotation, they will be expected to be able to check treatment plans more independently, discussing any unusual findings with the PlanCheck physicist. If possible, the resident should attempt to check all plans that are completed on a given day. The exception to this is when a treatment plan is completed on short notice, where there would be a risk of the patient treatment being delayed if the PlanCheck physicist does not have time to complete checking the treatment plan.

C. Credentialing Examination

1. After approximately 12 months (18 months for fellows), the resident will be examined for both POD and PlanCheck, with the intention of determining if the resident should be credentialed to take on those clinical duties independently. For POD, the resident will be expected to know what the POD duties are, how to fix minor problems, and how/where to seek assistance for other problems. For PlanCheck, the resident is expected to be able to describe the general process for checking a treatment plan, describe each of the checklist items, and describe some common problems that they have seen, and how they were dealt with.
2. After the successful conclusion of the credentialing examination, the resident shall be included in the clinical rotation for both POD and PlanCheck for the remainder of their residency (fellowship). In each quarter, the resident will be scheduled for approximately 4 POD days and 4 PlanCheck days.

IV. External Beam QA

The primary purpose of the treatment machine QA rotation is to become familiar with daily, weekly, and monthly quality assurance (QA) of a medical linear accelerator (linac). The rotation consists of four parts, as described below.

1. In phase 1 (approximately 1 month), the resident is expected to attend lectures on Linear Accelerator Operation and the overall Mayo QA program, participate in QA labs designed to familiarize the resident with safe operation of the linear accelerators, including startup and shutdown procedures, use of service mode, and observation of therapist daily QA. After learning how to operate the linac, the resident should perform the daily QA procedure independently and demonstrate to the medical physicist responsible for the linac the daily QC tests.
2. In phase 2 (approximately 3 months), the resident will be assigned to a linac, and will observe (and participate as determined appropriate by the responsible medical physicist, mentor) weekly and monthly QA on that linac. The resident should become familiar with AAPM guidelines, as well as any applicable state and/or federal regulations for QA of linear accelerators.
3. In phase 3 (approximately 6 months), the resident will perform weekly and monthly QA under the mentor's supervision. In the beginning, the mentor will directly observe the resident performing the QA. As this phase progresses, the mentor will allow the resident to perform more independently, while reviewing the resident's results and maintaining

responsibility for the QA of that linac. Near the end of phase 3, the resident will be credentialed to take responsibility for QA of a linac independently. The resident will be expected to be able to describe all aspects of daily, weekly, and monthly QA on the linac. If a hypothetical problem is found, the resident is expected to be able to describe the steps that need to be taken to determine if the problem is a result of machine and/or measurement variance, and what may need to be done before the machine is returned to safe operation in the clinic. Assuming successful completion of the credentialing examination, the resident will proceed to phase 4.

4. In phase 4, the resident is assigned to a linac as co-owner, to do regular weekly, monthly, and annual QA on a linac for the remainder of their residency. The other co-owner physicist will be a senior member of the physics staff that can monitor the resident's work and help as needed. The resident is expected to be able to perform the regularly scheduled QA independently.

V. Shielding and Room Design

1. Residents are expected to be able to design treatment room shielding adequate to ensure that environmental levels of radiation do not exceed those permitted by applicable state and federal regulations. This will be done for an appropriate photon beam and neutron shielding should be understood.
2. The concept of ALARA, cost vs benefit in this context will be understood.
3. The resident will understand the current formalism for determining adequate shielding, including all input parameters. The trade-offs between materials, machine placement, restricted areas and occupancy will all be reviewed.
4. Room penetrations, mazes and shielding doors will be discussed.
5. The resident will perform a full set of calculations for a given real or hypothetical room shielding scenario.
6. The resident will become familiar with shielding for brachytherapy applications, including HDR and a hot lab.
7. Pertinent references include:

    - NCRP report 151 (Dec 2005)
    - Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities, Patton McGinley (Radiation Shielding)
    - Various ACMP and AAPM refresher course slides/handouts on file.
    - NCRP Report No. 116, Limitation of Exposure to Ionizing Radiation (1993).
    - NCRP Report No. 107, Implementation of the Principle of As Low As Reasonably Achievable (ALARA) for Medical and Dental Personnel(1990)
    - NCRP report 40 Protection Against Radiation from Brachytherapy Sources (1972).

VI. Radiation Safety

1. The resident is expected to know appropriate institutional, state and federal regulations pertaining to the use, storage, transport, patient and personnel safety relating to ionizing radiation.
2. Resident will participate in at least two annual room surveys (as required by state regulations) to master the process of conducting a set of measurements around a linac vault and its subsequent analyses in order to sustain the claim that no levels are expected to exceed those permitted by applicable state and federal regulations. This will include an understanding of neutron measurements.
3. Resident will know how to calibrate and use a survey meter for the expressed purpose of assessing environmental levels of radiation.
4. A knowledge of setting up and running a safety monitoring program for personnel will be demonstrated by the resident.
5. The resident must be able to manage the ordering, receipt assay and disposal of all sources they expect to use or would have responsibility for as a Radiation Safety Officer (RSO).
6. The management of patients containing radionuclides must be understood and demonstrated.
7. The resident should become familiar with radiation area designation and monitoring, as well as event reporting guidelines and regulations.

VII. Treatment Machine ATP, Survey, Commissioning

1. Resident will complete an Acceptance Test Protocol (ATP) for a linear accelerator capable of producing photons and electron treatment beams.
2. The resident will understand the commissioning process and will be involved in obtaining all radiation beam measurements needed to calculate monitor units as well as provide data for entry into associated treatment planning systems. This will be done for at least one photon beam energy as well as one low-energy (about 6 MeV) and one high-energy (about 16-20 MeV) electron beam.
3. The resident will learn to calibrate all electron and photon beams on a linear accelerator according to the current AAPM protocol. They will also be responsible for learning the calibration procedures for low energy x-ray treatment units available in the clinic.
4. The resident will become fluent in the quality assurance program for a linear accelerator and applicable state/federal standards as well as AAPM guidelines. During rotations, the resident will carry out testing on a shared and supervised basis with the rotation mentor.
5. Electronic Portal Imaging Device (EPID) and other add-on technology commissioning and quality assurance will be understood and practiced by the resident.
6. The resident is expected to familiarize him/herself with troubleshooting clinical applications and develop the ability to provide reasonable problem solving to the treatment staff. Carrying out physicist of the day (POD) will be learned during rotations throughout the program.

VIII. Treatment Machine Calibration

1. The resident will review the TG51 calibration protocol (Almond PR, Biggs PJ, Coursey BM, Hanson WF, Huq MS, Nath R, Rogers DWO. AAPM's TG-51 protocol for clinical reference dosimetry of high-energy photon and electron beams. Med Phys 26(9):1847-1870, 1999.) and the TG21 calibration protocol (AAPM. A protocol for the determination of absorbed dose from high-energy photon and electron beams. Med Phys 10(6):741-771, 1983.) The resident will be able to describe the TG51 protocol, and the fundamental differences between the former and current calibration protocols.
2. The resident will calibrate a linear accelerator (all energies, photons and electrons) independently, but near the time of annual QA of the linear accelerator. The calibration will include an ion chamber inter-comparison. The results of the resident's calibration will be compared to the results from the annual QA.
3. The resident will be evaluated using an oral examination. The resident will be expected to describe how to calibrate a linear accelerator beam (electron and/or photon) using the current TG51 protocol, and how that differs from the previous TG21 protocol. Results from the resident's calibration will be presented and discussed in comparison to the annual QA.

IX. Simulator Acceptance Testing and QA (Fluoro)

1. **Basic fundamentals**: The resident should review basic fluoroscopic imaging concepts during the didactic portion of the rotation, and be prepared to discuss fundamentals of fluoroscopic image acquisition. This should include x-ray tube operation, focal spot, source to image distance, heat loading, heel effect, the principles of operation of the aS1000 detector, and how all of the above affect the image quality.
2. **Simulator operations**: The resident will learn basic Simulator operations through labs and review of the user manual. They should demonstrate familiarity and understanding of all imaging parameters as well as all basic X-ray operations; including tube warm-up, shutdown/startup, and routine simulation procedures. *(Recommended review material:* Acuity Reference Guide)
3. **Simulator QA and commissioning**: Commissioning and quality assurance skills will be developed by the resident.
    a. ***Simulator QA recommendations vs. regulations:*** The resident should become familiar with and be able to discuss AAPM recommendations, state regulations, as well as our program for Simulator QA (daily and monthly QA, commissioning) *(Recommended review material:* TG66, MN State Regulations, Mayo QA program)
    b. ***Simulator daily and monthly QA:*** The resident must obtain a level of skills and knowledge that permits him/her to understand and perform daily and monthly quality assurance tests, as well as troubleshoot problems detected with those tests. The resident will observe at least one monthly QA session and perform at least two monthly QA sessions under supervision. Once successfully credentialed, the resident will independently perform monthly QA on a simulator until the full fluoroscopic simulation rotation is complete.

c. ***Simulator annual QA:*** The resident is expected to observe annual simulator QA, and to demonstrate an understanding of the types of tests that are performed on an annual basis during the final oral rotation review.

d. ***Simulator commissioning:*** The resident is expected to either participate in the commissioning of a simulator if one is installed during the course of the rotation, or to create an outline of all simulator commissioning tests and to perform a subset of each type of test. The resident should be prepared to demonstrate understanding of simulator commissioning tests during the final oral rotation review.

4. **Simulation software:** The resident is expected to learn how to perform and support software associated with fluoroscopic simulation.

   a. ***Simulation software functionality:*** The resident should become familiar with and be able to demonstrate during the final oral rotation review an understanding of the functionality and support of the software utilized during simulation, and how the information generated is incorporated into treatment planning and delivery. *(Recommended review material:* Simulation, Acuity 6.5 Instructions for use)

5. **Clinical procedures**: The resident should become familiar with both basic and advanced simulation procedures, and be prepared to discuss during the final oral rotation review how fluoroscopic simulation with current tools differs from methods using virtual simulation. The resident should also be familiar with how the simulator can be used for cone-beam CT, including the effect of the cone-beam CT filters.

6. **Evaluation**: The resident will be evaluated by an oral examination at the end of the rotation. The resident must be able to demonstrate an appropriate level of familiarity with the above objectives in order to complete the examination successfully.

X. Simulator Acceptance Testing and QA (CT)

1. **Basic fundamentals**: The resident should review basic CT imaging concepts during the didactic portion of the rotation, and be prepared to discuss fundamentals of CT image acquisition as well as differences between diagnostic and RT scanners during the rotation evaluation. *(Recommended review material:* Bushberg, narrated CT PowerPoint files from Mayo Imaging Physics lectures)

2. **CT operations**: The resident will learn basic CT operations through labs and review of the user manual, and should demonstrate familiarity and understanding during a mid-rotation Operations & QA credentialing session of all scanning parameters as well as all basic CT operations, including tube warm-up, shutdown/restart, and routine scanning procedures. *(Recommended review material:* GE Lightspeed RT User Manual)

3. **CT QA and commissioning**: Commissioning and quality assurance skills will be developed by the resident.

   a. ***CT QA recommendations vs. regulations:*** The resident should become familiar with and be able to discuss AAPM recommendations, state regulations, as well as our program for CT QA during the mid-rotation credentialing (daily and monthly QA) and final oral rotation review (QA and commissioning). *(Recommended review material:* TG66, MN State Regulations, Mayo QA program)

b. ***CT daily and monthly QA:*** The resident must obtain a level of skills and knowledge that permits him/her to understand and perform daily and monthly quality assurance tests, as well as troubleshoot problems detected with those tests. The resident will observe at least one monthly QA session and perform at least two monthly QA sessions under supervision before scheduling a mid-rotation Operations & QA credentialing examination, during which the resident will demonstrate knowledge and experience with daily and monthly QA as well as CT operations described above. Once successfully credentialed, the resident will independently perform monthly QA on a CT simulator until the full CT simulation rotation is complete.

c. ***CT semi-annual QA:*** The resident is expected to observe semi-annual CT QA, and to demonstrate an understanding of the types of tests that are performed on a semi-annual basis during the final oral rotation review.

d. ***CT commissioning:*** The resident is expected to either participate in the commissioning of a CT simulator if one is installed during the course of the rotation, or to create an outline of all CT commissioning tests and to perform a subset of each type of test. The resident should be prepared to demonstrate understanding of CT commissioning tests during the final oral rotation review.

4. **Virtual simulation software:** The resident is expected to learn how to perform and support software associated with virtual simulation.

   a. ***Virtual simulation software functionality:*** The resident should become familiar with and be able to demonstrate during the final oral rotation review an understanding of the functionality and support of the various software packages utilized during virtual simulation, and how the information generated is incorporated into treatment planning and delivery. *(Recommended review material:* GE virtual simulation, fusion, and 4D software user manuals, Mayo internal How-To documentation)

   b. ***Virtual simulation software commissioning / QA****:* The resident should review recommendations for commissioning and QA in the noted reading materials, should outline a program for commissioning and/or QA of virtual simulation, and be prepared to discuss recommendations during the final oral rotation review. *(Recommended review material:* IAEA 430, TG53)

5. **Clinical procedures**: The resident should become familiar with both basic and advanced virtual simulation procedures (multi-field isocentric breast and cranio-spinal axis), and be prepared to discuss during the final oral rotation review how virtual simulation with current tools differs from previous methods using fluoroscopic simulators.

XI. External Beam Treatment Planning

The rotation is divided into four general areas, including (1) orientation, (2) CT-simulation competencies, (3) mock treatment plans, and (4) clinical treatment plans. Objectives for each area are outlined below, and a checklist for the resident to keep track of the rotation is attached. As much as possible, the resident should be immersed in the external beam treatment planning rotation, spending at least 60% of normal working hours working in dosimetry for a total of six weeks. While some after-hours work is allowable, working

primarily after-hours is discouraged so that the resident can take advantage of available dosimetrist expertise. It is the responsibility of the primary mentor as well as the resident to ensure that all areas are covered adequately. The attached checklist should be used to document that all areas have been covered.

1. **Orientation**: A primary dosimetrist mentor will be assigned to the resident for the duration of the rotation, although the assigned mentor may change as the rotation progresses. The primary mentor will orient the new resident to general dosimetry procedures including dataflow procedures, image retrieval and transfer, and treatment planning systems. The orientation is expected to last no more than 1–2 days.
2. **CT-Simulation Software**: The resident will be shown how to use the CT-simulation software to prepare the CT-simulation data for transfer to the treatment planning system. This will include, but is not limited to, the following tasks. The resident should be able to look at both plane films as well as sectional images and identify relevant normal structures as well as the general appearance of cancer (an anatomy class is taken during the first year of residency). Competency in using the CT-simulation software should be demonstrated by the end of the first week of the rotation.
    a. Using the automatic tools for creating the external contour or internal anatomy (such as lung or spinal cord).
    b. Couch removal and SSD verification.
    c. Verifying that no unintended changes to the planned isocenter have occurred between the CT-simulation and the transfer to the treatment planning system.
    d. Verify treatment unit and energy match physician's instructions.
    e. Creating automatic block apertures based on target volumes, and conversion of the aperture to an MLC setting.
    f. Creation and printing of reference DRR images.
    g. Transfer of treatment and/or image information to the treatment planning and/or record & verify systems, as appropriate.
3. **Mock Treatment Plans**: After completion of the CT-simulation section, the resident will proceed to developing "mock" treatment plans for single field, parallel-opposed, and three-field beam arrangements. During this section, the resident will become more familiar with the treatment-planning system without the time-pressure of a clinical treatment plan. The effects of energy, wedging, and beam-weighting should be investigated as appropriate. If an appropriate clinical case is available and treatment-planning time constraints are reasonable, a clinical case may be substituted. However, it is expected that once the clinical plan is completed, the resident will use a copy of the plan to investigate changing treatment-planning parameters. All mock treatment plans should be completed by the end of the third week of the rotation.
4. **Clinical Treatment Plans**: Once the resident is sufficiently proficient in the use of the treatment planning software, clinical cases should be planned for the following sites. In some cases (e.g., conventional head and neck), an appropriate clinical case may not be available during the time period of the rotation. In that case, an appropriate "mock" case or a previously-planned clinical case may be substituted. The resident should be careful

to monitor upcoming cases so that most of the desired treatment sites can be clinical treatment plans.

a. Breast
b. Prostate
c. Lung
d. Head and Neck (conventional, non-IMRT)
e. Pancreas
f. Pelvis/Endometrial
g. Esophagus
h. Sarcoma extremity
i. Hodgkin's disease (including "Mantle" field treatment technique)
j. 3-D brain
k. Craniospinal axis CNS

5. At the completion of the rotation, the resident should have completed all of the items on the attached checklist. The dosimetry mentor shall complete the Dosimetry Evaluation documenting the competency of the resident in the following areas. Any additional comments from dosimetry will be noted at this time.

   a. General dosimetry knowledge – has in-depth understanding of the abilities/limitations of dosimetry
   b. Technical skills – able to complete dosimetry plans with minimal supervision
   c. Interpretation of information – able to discern and optimize treatment plans
   d. Communication/presentation of data – able to transmit information to therapist (written and verbal)
   e. Completion of skills log – has well-rounded experience; completed all required skills

6. The final element of the external-beam treatment planning rotation is an oral examination. The examiners will included physics faculty as well as at least one dosimetrist familiar with the resident's work. The resident should be prepared to discuss the overall treatment-planning process, and at least two treatment plans that they had significant involvement with. The resident should know that standard approaches for treatment planning at the various sites, as well as reasons for deviating from standard approaches. A clinical example where the standard approach was not used (or was modified) would be helpful in evaluating the resident's knowledge in this area.

XII. TPS Commissioning

1. The resident will be able to perform acceptance testing of both the hardware and software for a Treatment Planning System (TPS).
2. The resident will learn to and perform commissioning of at least one clinical photon beam and/or electron beam in the TPS.

3. The resident will understand and be able to perform monthly quality assurance on the TPS.
4. The resident will understand the various Algorithms and their limitations within clinical TPS.
5. The resident will become familiar with Dicom RT communication.

XIII. MU Calculation

1. The resident will understand the formalism for manual Monitor Unit (MU) calculations its implementation in the clinic and in commercial monitor unit calculation programs.
2. The resident will understand the current standard (AAPM) methodology and parameters for calculating monitor units for photon and electron fields under SAD and SSD conditions.
3. The resident will provide a comparison of MU output from the current treatment planning system(s) with the formalism in #1. above. This will be done for a number of clinical cases under various conditions.
4. The resident will demonstrate understanding of how the MU second check is performed for each modality in our practice.
5. The resident will have an understanding of specification, acceptance testing, commissioning and clinical implementation of an MU program.
6. Primary references: AAPM TG71 (Formalism for MU calculations), Various treatment planning physics manuals (defining formalism used in TPS), Kahn, the Physics of Radiation Therapy 3rd Ed. Until replaced, in house software documentation (RADahl) on Mayo formalism)

XIV. IMRT

A. IMRT Planning

1. **Principles of IMRT:** The resident will be familiar with the history of IMRT, as well as the various commercially available systems for its planning and delivery. (Reference: Intensity-modulated Radiotherapy: Current status and issues of interest, Red Journal 51(4), p. 880-914.)
2. **Theory of Inverse Planning:** The resident will learn how our clinical planning system optimizes a treatment plan. He will be familiar with the inputs to the cost function, how it is calculated, and be familiar with the interplay between sometimes competing objectives.
3. **Special Contouring Techniques for IMRT:** The resident will be able to convert ‘clinical’ contours into inputs suitable for optimization. Target volumes are made unique and sometimes subdivided for various goals. Non-anatomical volumes are added to the patient anatomy, and margins are added to normal tissues. (Reference: ICRU 62)
4. **Dose Calculation and Plan Evaluation:** The resident will learn how our clinical system calculates actual dose distributions from optimal fluence maps. He will evaluate treatment plans with respect to dose heterogeneity, plan complexity, and susceptibility to setup variations.

5. **Practical Training:** The resident will plan a number of practice cases under the guidance of physics (a prostate and two head and neck) and then move to dosimetry to plan a number of live patient cases. The live cases will also involve the development of verification plans, documentation, and import to the record and verify system.
    a. **Practice cases:** one prostate, two head and neck
    b. **Live cases:** two prostates, two head and neck, two "other"

B. IMRT QA

1. **IMRT QA Overview:** The resident will be able to describe the elements of systemic and patient specific IMRT QA. He will be able to indicate which features of an IMRT plan must be validated before treatment and how they are tested within our clinic's QA program (References: AAPM IMRT QA report, Dan Low gamma function reference)
2. **IMRT QA Techniques:** The resident will become proficient in each of the IMRT QA systems used in our clinic and will be able to describe the strengths and weaknesses of each technique. He will be able to cite the specific reason for each test, know its thresholds for passage or failure, and know how to proceed if a plan fails QA.
    a. Ion Chamber measurements
        - Selection of dose measurement points
        - Setting up excel sheet for measurements
        - Delivering IMRT plan to phantom
    b. EPID Portal Dosimetry
        - Generation of portal dose images
        - Dosimetric calibration of EPID
        - Measuring portal dose images
        - Evaluation techniques (profiles, isodose, gamma)
    c. Film Dosimetry
        - Techniques, RIT analysis, etc.
        - Strengths and weaknesses compared to EPID
    d. MU calculation
        - When MU calculation is appropriate
    e. Matrix array
        - Strengths and weaknesses compared to film and EPID
3. **Practical Experience** Resident will spend at least two weeks functioning as IMRT2 physicist, practicing all aspects of routine IMRT QA.

XV. Special Applications

1. For total body irradiation (TBI) the resident will be able to perform acceptance testing, commissioning, treatment planning, treatment support, quality assurance and other appropriate duties in support of offering this special procedure to a patient.
2. For total skin electron therapy (TSET) the resident will be able to perform acceptance testing, commissioning, treatment planning, treatment support, quality assurance and other appropriate duties in support of offering this special procedure to a patient.
3. For small field conformal (SFC) - also known as stereotactic radiotherapy, the resident will be able to perform acceptance testing, commissioning, treatment planning, treatment support, quality assurance and other appropriate duties in support of offering this special procedure to a patient.
4. For Special Shielding/Dosimetry, the resident will be able to perform dose estimation, treatment support, quality assurance and other appropriate duties in support of offering Special Dosimetry support for a patient treatment.
5. After all of the special applications have been covered, the resident will have a mini-oral examination during the next scheduled quarterly review. The examination will cover aspects of all four special applications. The examination may be spread over two quarterly evaluations depending on how the rotation is scheduled.

XVI. Stereotactic (Gamma-knife)

1. **Basic fundamentals**: The resident should review basic stereotactic radiosurgery principals, with emphasis placed on application of Gamma Knife (GK) radiosurgery. The resident should be prepared to discuss fundamentals of treatment planning, treatment delivery and quality assurance. *(Recommended review material:* Khan, 3rd ed., Chapter 21, AAPM Report 54 Stereotactic Radiosurgery).
2. **Gamma Knife operations**: The resident will learn basic GK operations through observation and self study. Special emphasis should be placed on emergency procedures and regulatory adherence. *(Recommended review material:* GK User Manual)
3. ***GK QA recommendations vs. regulations:*** The resident should become familiar with and be able to discuss AAPM recommendations, state and federal regulations, as well as our program for GK QA. (10CFR35, MN State Regulations, Mayo QA program)
4. ***GK daily and monthly QA:*** The resident must obtain a level of skills and knowledge that permits him/her to understand and perform daily and monthly quality assurance tests, as well as troubleshoot problems detected with those tests. The resident will observe at least one monthly QA session and perform at least one monthly QA session under supervision.
5. ***GK annual QA:*** The resident is expected to observe (or simulate) an annual GK QA, and to demonstrate an understanding of the types of tests that are performed on an annual basis during the final oral rotation review.
6. ***GK commissioning:*** The resident is expected to either participate in the commissioning of a GK unit or or to create an outline of all GK commissioning tests and to perform a

subset of each type of test. The resident should be prepared to demonstrate understanding of GK commissioning tests during the final oral rotation review.

7. **Treatment Planning Software:** The resident should know how to import the relevant imaging studies into the Gamma Plan treatment planning software and how to create a treatment plan. This includes creation of target and avoidance structures, display of isodose lines, plan renormalization and DVH analysis.

8. **Safety analysis:** The resident should construct an independent safety analysis. This consists of a description of the imaging, planning, and treatment processes with descriptions of failure modes and suggested quality assurance responses/procedures.

9. **Clinical procedures**: The resident should observe and participate in at least 6 clinical treatment days and be able to describe the target volumes and OARs associated with at least 3 different clinical treatment sites.

XVII.IORT

1. For intraoperative radiation therapy (IORT), the resident will read the AAPM reports on IORT (listed below) and discuss the reports with the primary rotation mentor.

   a. Palta JR, Biggs PJ, Hazle JD, Huq MS, Dahl RA, Ochran TG, Soen J, Dobelbower RR, McCullough EC. Intraoperative electron beam radiation therapy: Technique, dosimetry, and dose specification: Report of task force 48 of the radiation therapy committee, American Association of Physicists in Medicine. Int J Radiat Oncol Biol Phys 33(3):725-746, 1995.

   b. Beddar AS, Biggs PJ, Chang S, Ezzell GA, Faddegon BA, Hensley FW, Mills MD. Intraoperative radiation therapy using mobile electron linear accelerators: report of AAPM Radiation Therapy Committee Task Group No. 72. Med Phys 33(5):1476-1489, 2006.

2. The resident will observe at least two IORT treatments, and review documented procedures for treatment planning, treatment support, and quality assurance as it applies to our practice.

3. The resident will be able to describe key differences in acceptance testing, commissioning, treatment planning, treatment support, and quality assurance with respect to standard external beam therapy.

XVIII. Brachytherapy

1. The resident will be familiar with procedures, hardware and isotopes used for the treatment of the most common anatomic sites treated with sealed source radionuclide therapy.

2. The physical characteristics, assay, handling, licensing and disposal (if applicable) of brachytherapy sources will be learned by the resident.

3. The resident must be able to quality assure the computer system used to generate information used to plan and treat patients with radionuclide sources.

4. The resident should be able to show competence in physics and dosimetric services in support of the clinical use of sealed radionuclide sources in the treatment of the following. If a case does not occur or is now extremely uncommon then the resident

should perform a mock treatment or the requirement may be waived at the discretion of the Rotation Supervisor.

a. biliary duct - intraluminal

b. eye plaque

c. permanent lung implants - planar

d. permanent prostate seed implants – volume interstitial

5. The resident should be able to show competence in physics and dosimetric services in support of the HDR clinical treatments of the following. If a case does not occur or is now extremely uncommon then the resident should perform a mock treatment or the requirement may be waived at the discretion of the Rotation Supervisor.

   a. vaginal cylinder HDR

   b. Tandem and Ring - Fletcher Suit - HDR

   c. Interstitial HDR

   d. Planar IOHDR

6. The resident should observe and actively participate in as many brachytherapy cases as reasonably possible such that they gain sufficient experience and confidence to do the case themselves. Because some cases do not occur very often the resident is expected to place a higher priority on the attendance of brachytherapy cases.

7. The resident should be able to perform all aspects of the LDR and HDR QA independently (although the resident will not be asked to do so if it not within regulations). The resident should participate in a minimum of two source exchanges.

8. At some point you should read the relevant TG reports. The Brachytherapy AAPM summer school (available via the AAPM virtual library and linked on the Radiation Oncology Physics Education website) is also an excellent reference to consult. The ABS publishes guidelines or surveys of brachytherapy procedures and a PUBMED Search on American Brachytherapy Society articles in the title will yield possibly useful articles, i.e. American Brachytherapy Society [title].

   Of course a very important part of the medical use of isotopes is the NRC regulations. The latest edition of Khan has a fair amount of Brachytherapy in it.

XIX. Regional Practice Rotation

1. Following POD and PlanCheck credentialing, the resident will be scheduled to share in providing physics support at one of the regional sites. The intention of this rotation is to provide experience with a different (smaller) practice, while still having the safety net of having a number of physicists at the main center that can be called on for assistance. A primary mentor for this rotation will be assigned, based on the regional site being covered.

2. The resident will be evaluated on this rotation as part of their quarterly evaluations. Feedback from the primary mentor, as well as the onsite personnel (dosimetrists, therapists, physicians) will be used to determine if the resident is performing satisfactorily

Attachment 7. Description/Application Materials Provided Prospective Residents

I. Description provided for email or hardcopy inquiries

A. Program Description

The two-year Radiation Oncology Clinical Medical Physics Residency Program at Mayo Clinic Rochester is designed for candidates with doctoral degrees in the relevant physical sciences who are interested in careers as clinical medical physicists in radiation oncology. This program concentrates on the medical uses of physics in clinical treatment of cancer patients; it does not focus on training in theoretical physics or basic research.

B. Clinical Training

During the first 18 months of the residency, you will take clinical rotations through the following subspecialty areas:

- Quantification of radiation
- Radiation Safety
- Linear Accelerator siting, acceptance testing and quality assurance
- Imaging for planning and treatment verification
- Brachytherapy including High Dose Rate (HDR) and cardiac applications
- Computer assisted treatment planning
- Quality control of the treatment process
- New delivery techniques including:
    - Intensity Modulated Radiation Therapy (IMRT)
    - Stereotactic radiosurgery (SRS) and radiation therapy (SRT)
- Special procedures including:
    - Intraoperative radiation therapy (IORT)
    - Total skin electrons (TSE)
    - Total body irradiation (TBI)

In addition, your clinical training will include work on department projects, carried out under the supervision of the medical physics faculty.

C. Didactic Training

Clinical conferences, seminars, small discussion groups, journal clubs and one-on-one instruction are all an integral part of the program. You will participate in the following: Medical Physics Journal Club, Physics Section clinical updates, medical physics conferences, treatment planning conferences, and assigned readings.

D. Competency

Clinical competency is evaluated by an oral exam of reports generated for each of the clinical experience areas.

E. Research Experience

During the latter part of your second year of training and depending upon your progress in learning the clinical aspects, you may have the opportunity to concentrate on a particular area of interest, and design and execute a research project. Opportunities exist for collaborative research with staff members from other departments. You will submit the results of your research project for presentation at a scientific meeting and prepare a manuscript for publication in a scientific journal.

F. Appointments and Applications

To be eligible to apply, you must have a Ph.D. (or equivalent degree) in medical physics, in a related physical science or engineering. Applications for each academic year, which begins in July, should be completed by December 15. If you are considered for an appointment, you will be asked to visit Mayo Clinic Rochester for an interview with the program director and selected faculty. Interviews usually are conducted in February.

G. Inquiries

For more information, please submit the following information via e-mail:

- Program Name
- Your Name
- Phone Number
- Address
- School Attended
- Year of Graduation

or contact

Michael G. Herman, Ph.D.
Department of Radiation Oncology
Mayo Clinic
200 First Street SW
Rochester, MN 55905
507-284-4655

Extensive information regarding Mayo Clinic, the MSGME, the residency and fellowship programs, and online applications can be found at the MSGME and Mayo Clinic websites.

- http://www.mayo.edu/msgme/radoncology-programs.html
- http://www.mayo.edu/

Attachment 8. Radiation Oncology Clinical Medical Physics Residency Committees

I. Education Executive Committee

Chair: Michael G. Herman, Ph.D.

Members: John A. Antolak, Ph.D.

Debra H. Brinkmann, Ph.D.

Keith M. Furutani, Ph.D.

Michael G. Herman, Ph.D.

Robert W. Kline, Ph.D.

Jon J. Kruse, Ph.D.

Advisors: Paul D. Brown, M.D. (Program Medical Director)

Janelle M. Miller, CMD (Dosimetry)

II. Interview Committee

In addition to Education Executive Committee membership includes:

Paul D. Brown, M.D.
Program Medical Director,
Chair, Radiation Oncology Education Committee

Jann N. Sarkaria, M.D.
Radiation Oncology Physician

Attachment 9. Example Resident Interview Schedule

<<Interviewee Name>>

Medical Physics Residency Interview

<<Interview Date>>

Begin		End	Meeting With	Location
8:00	–	8:30	Welcome Session Michael G. Herman, Ph.D. Medical Physics Fellowship Program Director John A. Antolak, Ph.D. Medical Physics Residency Program Director	Ch-S-243
8:30	–	9:30	30 Minute Presentation followed by Group Interview with Physics Consultants, Clinical Physicists, and Medical Physics Fellows and Residents **Presentation:** *<<Presentation Title Here>>*	Ch-S-243
9:30	–	10:15	Interview with Jann N. Sarkaria, M.D. Radiation Oncology Medical Staff Consultant	Ch-S-124
10:30	–	11:15	Interview with Paul D. Brown, M.D. Radiation Oncology Medical Staff Consultant and Radiation Oncology Medical Program Director	Ch-S-126
11:30	–	1:00	Lunch with Medical Physics Fellows and Resident Drs. Houssam Abou Mourad, Yildirim Mutaf, Kathy Kolsky, Steve Ratliff, Luis Fong	Pappa George Restaurant
1:00	–	1:30	Michael G. Herman, Ph.D. Physics Consultant and Education Program Director	Ch-S-131
1:30	–	2:00	Keith M. Furutani, Ph.D. Physics Consultant	Ch-S-117
2:00	–	2:30	Jon J. Kruse, Ph.D. Physics Consultant	Ch-S-130
2:30	–	3:00	Robert W. Kline, Ph.D. Physics Consultant	Ch-S-135
3:00	–	3:30	John A. Antolak, Ph.D. Physics Consultant and Residency Program Director	Ch-S-140A
3:30	–	4:00	Janelle A. Molloy, Ph.D. Physics Consultant	Ch-S-140B
4:00	–	4:30	Debra H. Brinkmann, Ph.D. Physics Consultant	Ch-S-133
4:30	–	5:00	Wrap-Up Session – John A. Antolak, Ph.D.	Ch-S-243

Attachment 10. Clinical Medical Physics Residency Candidate Evaluation Form

RANK_____

Clinical Medical Physics Residency Candidate Evaluation Form

Name of Candidate: KOVALCHUK, Nataliya

Date of Interview: **February 5, 2008**

Scores:

_____Interest, reasons for candidacy for this residency
_____Knowledge of Radiation Oncology Medical Physics
_____Technical skill set including experimental experience
_____Application (references, transcripts, etc.)
_____Communication and interaction skills
_____Initiative and Productivity

Scale
1 = outstanding
2 = excellent
3 = good
4 = satisfactory
5 = unacceptable

Overall Score: _____ (does NOT have to be your average score)

Comments:
_____
_____
_____
_____
_____

Interviewer Name: John A. Antolak, Ph.D.

Interviewer Signature: _____ **Date:** _____

Attachment 11. Example Letter of Appointment from MSGME

MAYO CLINIC
College of Medicine

200 First Street SW
Rochester, Minnesota 55905
507-284-2220

Mayo School of
Graduate Medical Education

February 15, 2008

Nataliya Kovalchuk
16615 Palm Royal Drive #314
Tampa, FL 33647

Dear Ms. Kovalchuk:

Your application for fellowship training was reviewed by the Graduate Education Committee –Medical and Laboratory Specialties at the request of the Department of Radiation Oncology. I am pleased to inform you that the Committee approved your appointment to a two-year program beginning June 28, 2008 through June 25, 2010 in the Medical Physics residency at graduate level one. Continuation and completion of the program are dependent upon satisfactory progress in education, performance of all duties, and compliance with Mayo School of Graduate Medical Education policies.

Your appointment to Mayo School of Graduate Medical Education is contingent upon the following conditions, which must be met before the start of your training program:

1. The following documents and letters must be received by MSGME:
   - Complete official transcripts from all post-secondary educational institutions you have attended:
     a) Graduate school
   - A copy of your graduate school diploma
2. In addition to sending the above materials, you must:
   - Obtain one year of work authorization based on optional practical training by June 28, 2008 and H-1B visa classification by June 27, 2009 for the remaining year of the program.
     Ms. Ann Lance, 507-284-2915, is the appropriate contact for visa questions.
   - Pass background checks
   - Pass a nurse health review/urine drug screen administered at Mayo Clinic
   - Provide proof of your legal right to work in the U.S. by bringing appropriate documents that establish identity and employment eligibility to MSGME orientation.
3. If you are currently in graduate school, you must have your school's Registrar send your final transcripts to MSGME upon graduation. The appointment is contingent upon completion of all program requirements for a PhD including the thesis defense.
4. You are expected to report to MSGME orientation beginning June 30, 2008.

Approximately eight weeks before your training program begins, you will receive an informational packet that will provide details pertaining to your appointment and compensation and benefits, and prepare you for your Mayo Clinic orientation.

Please sign and date the enclosed copy of this letter and the pink post-appointment sheet and return them **within ten days** in the self-addressed envelope.

By signing this letter, you accept appointment to the Mayo School of Graduate Medical Education, and you agree to comply with our policies summarized for your convenience in the enclosed Summary of Resident Policies. If you have any questions, please feel free to contact us.

Sincerely,

Lisa A. Drage, M.D.
Associate Dean
Medical and Laboratory Specialties

LAD:jkb

POSITION ACCEPTED: _____ DATE: _____

Nataliya Kovalchuk

_____

U.S. Social Security Number

Attachment 12. Example Advertisement

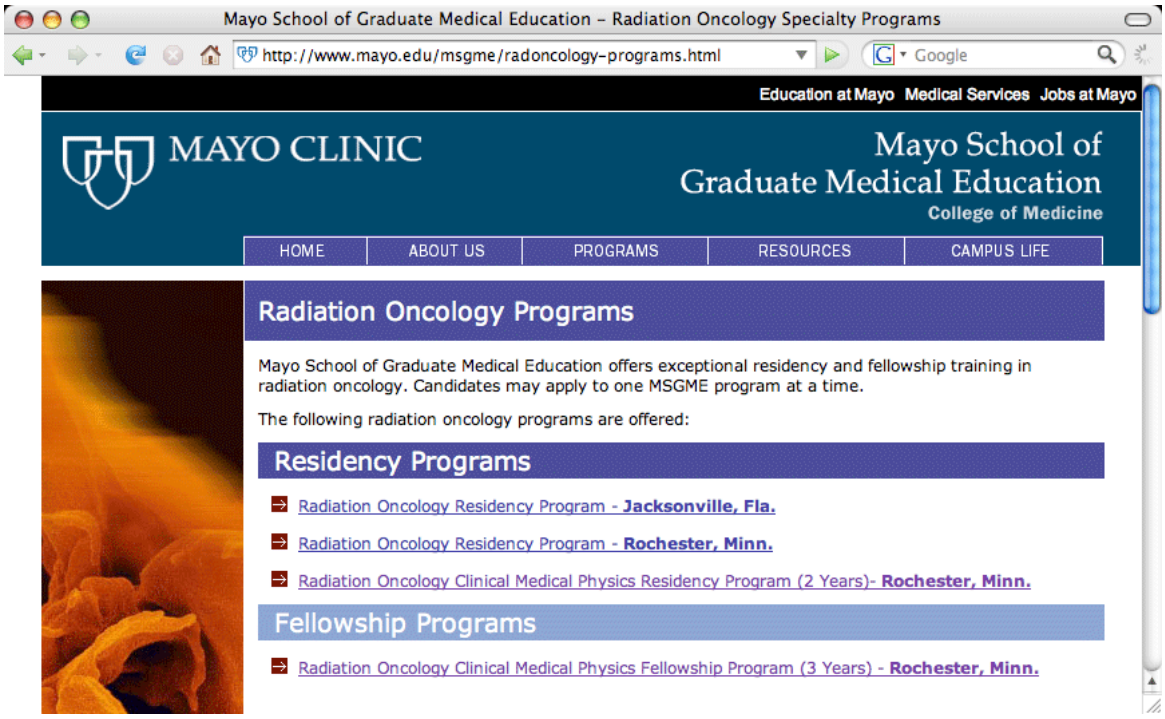
The following is an example of an advertisement placed on the AIP website. A similar advertisement is submitted to the AAPM Blue Book.

Clinical Medical Physics Residency/Fellowship
Mayo Clinic, Division of Radiation Oncology

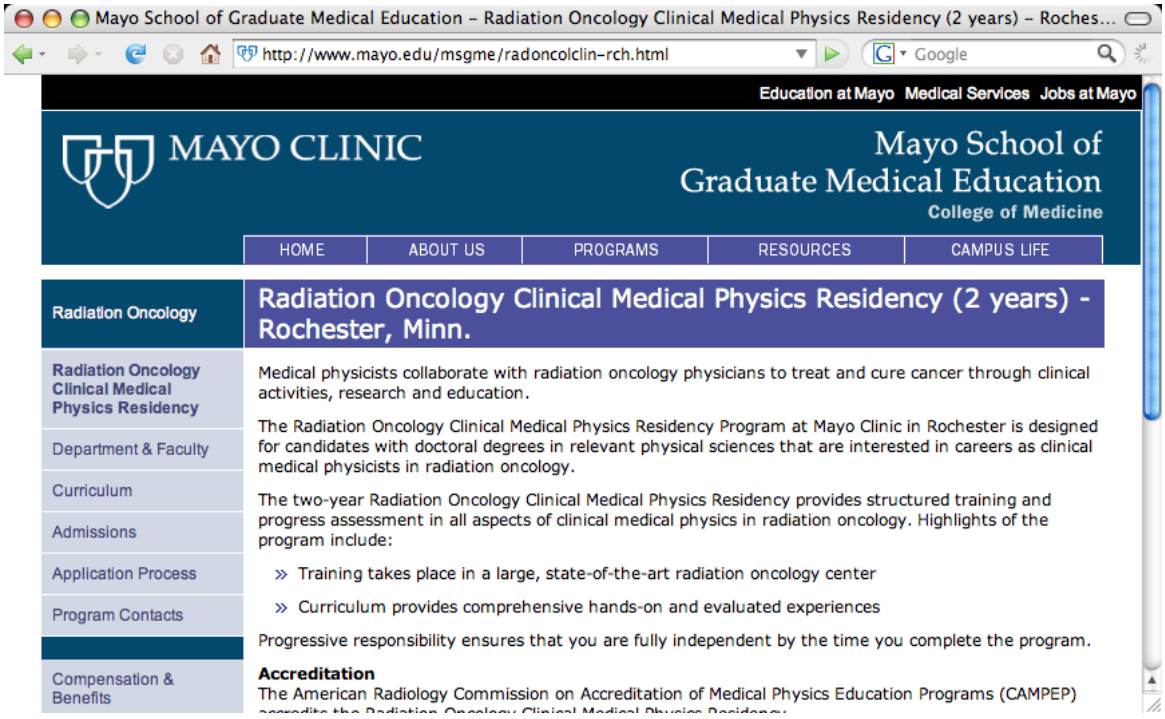
The Department of Radiation Oncology at Mayo Clinic, Rochester, MN invites applications for residency and fellowship positions in clinical medical physics. Apply your experimental skills making a positive difference in a high technology clinical environment. Individuals will receive training in all essential aspects of clinical radiation oncology physics in our CAMPEP accredited Medical Physics Residency Program. The three year fellowship and two year residency commence in July 2007. The fellowship position also includes clinical research effort involving digital imaging, treatment planning and treatment optimization in radiation oncology. Qualified individuals should possess a recent Ph.D. in medical physics or experimental physics and have demonstrated ability to manage all aspects of an experimental research project, including data acquisition and analysis, software development and documentation. Excellent communication skills and the desire to interact with patients and other healthcare professionals is essential. The successful candidates will join a Physics Section of 7 Ph.D. faculty, 11 clinical physicists, 4 residents/fellows and computer support personnel. The Physics Section supports all aspects of the Mayo Rochester clinical radiation oncology program, research and graduate education. Please see http://www.mayo.edu/msgme/radoncology-programs.html for more information and application material or email herman.michael@mayo.edu or lee.elaine@mayo.edu.
Mayo Clinic is an equal opportunity/affirmative action employer.

Attachment 13. MSGME Radiation Oncology Home Page

The following picture shows the Mayo School of Graduate Medical Education (MSGME) Radiation Oncology page, where the Clinical Medical Physics Residency and Fellowship programs are listed.



The following picture shows the MSGME page for the Clinical Medical Physics Residency program. The MSGME page for the Fellowship program is similar.



Attachment 14. Clinical Medical Physics Rotation Examination Form

At the end of each rotation, the resident has an oral examination covering the objectives of the rotation. The results of the examination are recorded on the form, an example of which is shown below. For some rotations, such as POD (physicist of the day) and Plan-Check, successful completion of the examination also serves as documentation of clinical competency to perform those duties. After one year of the residency program (18 months for fellows), the resident is scheduled to cover core clinical duties for approximately 20% of each quarter (slightly less for fellows). The exact number of days depends on clinical needs and can vary during the year (depending on research needs of the fellows, for example).

Medical Physics Training Evaluation – Oral Exam

Resident Houssam Abou Mourad, Ph.D. Date December 19, 2006

Topic Shielding Rotation Exam

Rotation Mentor: _____

Staff Mentor: John A. Antolak, Ph.D.

Oral Examiners

- ☐ John A. Antolak, Ph.D.
- ☐ Debra H. Brinkmann, Ph.D.
- ☐ Keith M. Furutani, Ph.D.
- ☐ Michael G. Herman, Ph.D.
- ☐ Jon J. Kruse, Ph.D.
- ☐ Robert W. Kline, Ph.D.
- ☐ Janelle A. Molloy, Ph.D.

Comments:

_____

_____

_____

_____

_____

Satisfactory Unsatisfactory

Signed _____
Faculty Member

Attachment 15. MSGME Quarterly Evaluation Form

The Mayo School of Graduate Medical Education requires that residents and fellow be graded on a quarterly basis (minimum requirement). The training elements that need to be evaluated are clinical rotation performance, technical skills and judgment, fund of knowledge, team relationships and maturity, and research (applies to fellows only). The following shows the form that we use to document the evaluation.

QUARTERLY EVALUATION
Mayo School of Graduate Medical Education
Clinical Medical Physics Fellowship
Department of Radiation Oncology

Name: Xxxxx X. Xxxxx, Ph.D. **Rotation Dates:** 12/30/2006 thru 03/30/2006
Winter 2007

PERID: xxxxxxx **Start Date:** 7/2/05

Training Elements	S	U	UE
Clinical Rotation Performance			
Technical Skills/Judgment			
Fund of Knowledge			
Team Relationships/ Maturity			
Research			
Overall			

Evaluation Criteria
S Satisfactory
U Unsatisfactory
UE Unable to evaluate

Current Rotation(s) Š

Didactic Instruction Š

Research/Projects Š

MentorÕsSignature _____ **Date** _____

ResidentÕsSignature _____ **Date** _____

Program Director _____ **Date** _____

Attachment 16. MSGME Policies Summary

The following is a summary* of selected Mayo School of Graduate Medical Education (MSGME) Policies. The complete policies are available through the MSGME Policy Manual table of contents.

I. Resident Responsibilities

The position of resident physician entails the provision of care commensurate with the resident physician's level of advancement and competence, under the general supervision of appropriately privileged attending teaching staff. This includes:

- Participation in safe, effective and compassionate patient care.
- Development of an understanding of the ethical, socioeconomic and medical/legal issues that affect graduate medical education and of how to apply cost containment measures in the provision of patient care.
- Participation in the educational activities of the training program and, as appropriate, assumption of responsibility for teaching and supervising other residents and students; participation in institutional orientation and education programs; and participation in other activities involving the clinical staff.
- Participation in institutional committees and councils to which the resident physician is appointed or invited.
- Performance of these duties in accordance with the established practices, procedures and policies of the institution, and those of its programs, clinical departments and other institutions to which the resident physician is assigned, including, among others, state licensure requirements for physicians in training where these exist.

II. Duration of Appointment and Conditions of Continuation

Individuals are enrolled in MSGME after they have accepted an official offer of appointment from an MSGME Dean/Associate Dean and have met the contingencies stated in the appointment letter and completed applicable registration, licensure, and visa requirements. The appointee must also have satisfactory completion of a qualified medical school as well as proof of the legal right to work as required by federal law. Annual continuation of training to subsequent years will be dependent upon satisfactory progress in education, performance of all duties, and compliance with MSGME policies.

III. Confidentiality

All members of the Medical Center have an obligation to conduct themselves in accordance with Mayo's Confidentiality Policy and hold in confidence all information concerning patients, employees and business information. Confidential information includes all material, both paper-based and electronic, related to the patient care and operation of the Medical Center. Any carelessness or thoughtlessness in revealing any confidential information, leading to the release of such information, is not only wrong ethically but may involve the individual and Mayo

* This summary was copied from <http://mayoweb.mayo.edu/msgme-policies/intro-26point-summary.html> (Mayo intranet, May 2007). It is also available on the internet at <http://www.mayo.edu/msgme/documents/msgme-summary.pdf>. The complete policies are available to the residents on the Mayo intranet.

legally. Unauthorized access, use or release of any and all confidential information at Mayo Medical Center may be cause for immediate dismissal.

IV. Licensure

All appointments require an individual to have successfully matriculated from an approved Medical School. Prior to the first day of training in MSGME, residents must obtain either a valid medical license or must be registered with the Medical Licensing Board as is applicable under the laws of the State. All residents/fellows are required to obtain and maintain the appropriate medical license while enrolled in MSGME. Failure to meet applicable eligibility requirements without delay and obtain and maintain a residency permit followed by a medical license, will result in one or more of the following:

- Delay or revocation of appointment;
- Preclude advancement to the next postgraduate level;
- Preclude continuation in the residency program;
- Disciplinary action for non-academic deficiency.

Appointees who fail any step of USMLE three times will not be appointed to, or allowed to, remain in MSGME.

V. Visa Sponsorship Policy

Mayo supports ECFMG J-1 visa sponsorship for residents appointed to MSGME. In limited circumstances that benefit the institution, the H-1B visa may be used.

To be ECFMG certified for the J-1 visa, the individual must:

- Pass USMLE step 1
- Pass USMLE step 2 CK (Clinical Knowledge)
- Pass USMLE step 2 CS (Clinical Skills)
- Have graduated from a recognized medical school and have a credentialed medical school diploma

The above steps must be completed to begin a training program. USMLE Step 2 CS must be taken by December 31 of the year prior to the NRMP match in order to be eligible to participate.

To use the H-1B visa, the individual must complete the three steps above and must also:

- Pass USMLE step 3, and
- Be registered or licensed with the Minnesota Board of Medical Practice before completing the program.

Because the J-1 visa is the standard visa at Mayo for International Medical Graduates in medical residencies, exceptional use of the H-1B visa requires internal review and ultimately approval of the MSGME Dean.

Additional information is available in the MSGME Comparison of H-1B and J-1 Visa Categories statement.

VI. Drug Screening

All residents will be required to complete and pass a drug screening test as a condition of their appointment to MSGME

VII. Background Studies

Criminal background checks are required for all Mayo residents and fellows. If an individual is found to be convicted of serious criminal offenses, such as assault, criminal sexual conduct, etc. that disqualify the individual from positions with direct patient contact, the individual becomes ineligible for appointment or continuation of appointment in MSGME.

VIII. Stipend and Benefits

Stipend level will be increased annually on the anniversary date of the commencement of the residency based on the continuation in the program at the next level of training. The increase will be dependent on satisfactory performance of assigned duties by the resident and satisfactory evaluations by the program director and faculty.

Mayo offers a choice of health plans which vary in contributions made by the resident/Mayo and in coverage amounts. Further benefit information including, but not limited to, disability and life insurance is available on the following web pages: Stipend and Benefits: Jacksonville Programs, Rochester Programs, Scottsdale Programs

IX. Vacation Policies

The annual vacation allowance is 15 days (3 weeks) for all residents. Weekends and Mayo holidays are not charged as vacation time. Vacations must be approved by the appropriate department/program representative. A maximum of five vacation days may be reimbursed or may be carried over to the next year with program director approval (contingent upon continued enrollment within the same program and upon accreditation/certification requirements). The use of vacation days during the final week of training is discouraged.

X. Leave of Absence and Short Term Disability

Residents may request a leave of absence for a variety of reasons. All leave requests (to include emergency, family medical/parental leave, personal, and military) must be approved by the program director or designee, in compliance with MSGME policy. Requests for leave of absence greater than one week must be approved by MSGME.

If residents become ill, stipend and benefit coverages continue for up to three months per year under Mayo's short-term disability policy. Absences due to illness must be recorded and submitted to the appropriate education coordinator.

XI. Policy on Effect of Leave for Satisfying Completion of Program

Each training program determines the total absence time permitted during each year of the program. Where applicable, the total absence time permitted will be in accordance with the certification requirements of the specialty board. Absence in excess of the designated time may extend the resident's training time. Questions should be directed to the specific program director in advance of the resident's planned absence.

XII. Professional Liability Insurance and Tail Coverage

Mayo Clinic will provide professional liability insurance for the resident's activities in MSGME regardless of when the claim arises. It is expected that the resident will assist and cooperate with the institution in the defense of any claim that may be brought by any patient attended by the resident - even if the claim or suit arises after the completion of training.

Mayo Clinic professional liability protection is not extended to a resident engaged in professional activities that are not part of a Mayo program (e.g., moonlighting). However, if the resident conducts charitable or public service professional activities with the approval from the appropriate department chair or program director and does not receive payment outside of Mayo, Mayo's professional liability protection may be provided if the sponsoring institution does not supply such coverage.

XIII. Counseling, Medical, Psychological Support Services

Mayo's Employee Assistance Program is available to MSGME residents. This program provides confidential assistance for personal problems. Trained employee assistance coordinators offer information, assessment and short-term counseling, as well as referral for special situations or longer-term needs.

The service is free, and no record of contact is placed in the student's medical records, Health Service records or student file. All contact is kept confidential, except as required by law or in situations deemed potentially life-threatening by the employee assistance coordinator.

XIV. Policy on Physician Impairment and Substance Abuse

Mayo regards alcohol or chemical dependency as illnesses that can be medically treated. Professional assistance and referral resources are available in the online MSGME policy manual. Once started in the program, resident appointments will not be jeopardized solely for requesting help for the diagnosis and treatment of a drug dependency illness. Such matters will be decided on the merits of each individual's performance in the same manner as for any individual with or without other health problems.

If a resident is determined to be unable to perform satisfactorily and safely in the program at any time, a colleague or supervising faculty member will escort the resident to the nearest employee health service location for an immediate consultation with one of the Employee Health Service physicians. The resident will be relieved of all patient care responsibilities until this evaluation is complete. Resumption and continuation in the residency program will be based on the resident's ability to satisfactorily perform responsibilities and requirements.

Resident entry into a program is contingent upon drug or alcohol testing results as defined by Mayo site.

XV. Conditions for Sleep Rooms, Meals, Laundry

Each hospital provides adequate on-call rooms. Residents who are required to remain in the hospital for on-call service will receive a meal allowance for use in the hospital cafeterias up to established dollar limits. In addition, residents may receive a meal allowance when special on-duty schedules require the resident's presence in the hospital beyond usual duty hours. Food is available in resident lounges during hours when hospital cafeterias are not open. Scrub suits are provided and laundered for residents who are on-call overnight in the hospital or who are assigned to departments that wear scrub suits in the course of their usual activities.

XVI. Policy on Professional Activities Outside of Program

Residents are not required to engage in moonlighting. Moonlighting is permitted for those who hold a valid license to practice medicine (except for international medical graduates as defined below). Residents must obtain a prospective written statement of permission from their program director that must be made part of the resident's file. Time spent moonlighting must not interfere with the resident's reading and studying, family time, sleeping, relaxation, and most importantly, one's program requirements and academic performance at Mayo. Under no circumstances should patient care at Mayo be jeopardized or infringed upon because of resident moonlighting activities. The resident's performance will be monitored for the effect of these activities upon performance. Adverse effects may lead to withdrawal of permission. MSGME will not assume responsibility for credentialing the resident nor assume any liability related to extramural moonlighting activities. Residents on an H-1B visa or a J-1 visa sponsored by ECFMG are not permitted to moonlight.

Other professional activities outside the training program, should conform to guidelines set forth in Mayo Clinic's Industry Relations policy. Off-campus, industry-sponsored events are appropriate to attend only if they serve some educational function that is not related to the sponsoring company. Modest hospitality such as meals or other refreshments associated with the event may be accepted as long as the event includes a structured educational component (e.g., formal speaker, demonstration, etc.). Educational programs must be substantial in content and not pro forma. Industry-sponsored social events with no structured educational component are not appropriate.

XVII.Disciplinary Procedure

Appointees to MSGME may be placed on probation or dismissed for significant, documented deficiencies. An academic or non-academic deficiency could result in either a formal warning or probation, depending on the judgment of the faculty as to the type and degree of the deficiency. Both Formal Warning and Probation include a remedial plan to improve performance. The warning is removed from the individual's MSGME record if the issues are fully remediated. Probation and/or dismissal will likely result if unsatisfactory performance continues. A record of the probation and outcome remains in the individual's MSGME record. The resident has the right to appeal the decision of the program if dismissed. Due process is outlined in the MSGME Probation and Dismissal policy and is closely monitored. An Ombudsperson is available to residents during the disciplinary process.

XVIII. Grievance Procedures

The resident and his or her program director should make every reasonable effort to resolve any conflicts, problems, or disagreements that arise related to the application of Mayo's policies and procedures. In instances where the resident is uncomfortable taking a complaint to his or her Program Director, the resident should contact his/her assigned Advisor, the Division/Department Education Chair, the Division/Department Chair, the MSGME Administrator, the MSGME Associate Dean, the Mayo Fellows Association, or the MSGME Ombudsperson.

Resident allegations of academic misconduct by faculty should be directed to the Department Chair or an MSGME Associate Dean. The MSGME policy entitled Faculty Misconduct Allegations will be followed.

The MSGME appeal policy, as outlined in the Probation policy, is available to individuals with grievance outcomes.

XIX. Equal Opportunity and Affirmative Action

Mayo Clinic seeks and selects persons for appointment, employment or admission - and to train, advance, promote, transfer and compensate such persons - on the basis of individual capability, potential or contribution to the programs and goals of the institution. Mayo Clinic makes these selections and subsequent personnel decisions without regard to age, disabilities, marital status, national origin, race, religion, gender, sexual orientation, or Vietnam era veterans status. Furthermore, Mayo Clinic supports and observes stated policies of the State and Federal governments that preclude discrimination.

XX. Policies on Mutual Respect and Harassment

Disrespectful behavior of any kind - sexual or any other form, ranging from inappropriate humor and subtle hints to overt acts, threats, or physical contacts - will not be tolerated. An individual who experiences intimidation or harassment is asked to report the incident using the reporting process outlined in the MSGME Sexual Harassment policy. It is the responsibility of residents who believe they have been intimidated or harassed to report such behavior so that the behavior can be investigated and appropriate action taken.

Residents subjected to unwelcome sexual conduct or lack of mutual respect should inform the perpetrator that the conduct is considered offensive and must stop. If the response of the perpetrator is unsatisfactory, the student should report the matters to any of the following: Program Director; MSGME Administrator, Associate Dean/Director, or Dean; Diversity/Mutual Respect Office; or Department of Human Resources. This policy also applies to residents who have witnessed alleged harassment or have had incidents of alleged harassment reported to them. An investigation will follow and the appropriate action taken after a review by designated members of Administration or the educational program’s governing committee.

XXI. Adverse Accreditation Actions, Residency Closure/Reduction Policy

In accordance with ACGME requirements, MSGME will inform residents in writing of confirmed adverse accreditation actions taken by the Accreditation Council for Graduate Medical Education. If Mayo should begin the process of closing a residency training program, the residents will be informed four months or more before the end of their appointment, or as early as possible if the closure occurs within four months of the appointment end. MSGME will make every effort to enable residents in the program to complete their education or assist the residents in enrolling in an ACGME-accredited program in which they can continue their education.

XXII. Duty Hours

Fatigue can negatively affect patient care, resident education, and resident well-being. MSGME has established policies regarding resident duty hours and supervision to assure full compliance with Accreditation Council for Graduate Medical Education (ACGME) requirements and to avoid situations where patient care and resident welfare are compromised by excessive service obligations.

Duty hours are defined as all clinical and academic activities related to the residency program, i.e, patient care (both inpatient and outpatient), administrative duties related to patient care, the provision for transfer of patient care, time spent in-house during call activities, and scheduled academic activities such as conferences. Duty hours do not include reading and preparation time spent away from the duty site.

- Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities.
- Residents must be provided with 1 day in 7 free from all educational and clinical responsibilities, averaged over a 4-week period, inclusive of call. One day is defined as one continuous 24-hour period free from all clinical, educational, and administrative activities.
- In-house call must occur no more frequently than every third night, averaged over a four-week period.
- Continuous on-site duty, including in-house call, must not exceed 24 consecutive hours. Residents may remain on duty for up to six additional hours to participate in didactic activities, transfer care of patients, conduct outpatient clinics, and maintain continuity of medical and surgical care as defined in RRC Specialty and Subspecialty Program Requirements.
- Adequate time for rest and personal activities must be provided. This should consist of a 10-hour time period provided between all daily duty periods and after in-house call.

MSGME programs monitor duty hours carefully. Detailed information about ACGME requirements regarding resident duty hours is available on the ACGME web site under the heading “resident duty hours.”

XXIII. Evaluation

Each MSGME program completes multiple evaluations:

- Evaluation of Residents : Residents are evaluated at the end of each rotation or assignment, or each quarter , by faculty with whom they have been assigned. These evaluations are recorded in the MSGME office. If desired, the resident may review the evaluation with his or her adviser, Program Director, the Associate Dean or an MSGME representative. Unsatisfactory performance may result in warning and/or probation and/or termination.
- Evaluation of Faculty: Residents must be given the opportunity to evaluate faculty teaching at the conclusion of each assignment. Faculty evaluations must be reviewed by the training Program Director and Department Chair. The evaluations should include a review of their teaching abilities, commitment to the educational program, clinical knowledge, and scholarly activities.
- Program Evaluation: All programs must evaluate the educational effectiveness of the residency program at least annually in a systematic manner. Representative program personnel (at least the program director, representative faculty, and one resident) must be organized to review program goals and objectives, and the effectiveness with which they are achieved . In the evaluation process, the group will take into consideration written comments from the faculty, the most recent internal review report of the GMEC of the sponsoring institution, and the residents’ confidential written evaluations. Written minutes of these meetings will be maintained by the program.
- Final Evaluation: The Program Director will provide a final summative evaluation for each resident who completes the program. This evaluation must include a review of the resident’s performance during the final period of education, and should verify that the

resident has demonstrated sufficient professional ability to practice competently and independently. The final evaluation will be maintained as a part of the resident's permanent MSGME record.

XXIV. Infection Control

Infection control policies are designed to reduce the risk of infection among patients, employees and visitors. All residents are expected to comply with these policies, including hand washing, standard (universal) precautions, isolation procedures, and other prevention and control measures as outlined in the Infection Control Manual or as directed by the Medical Director of the Infection Control Program. Compliance with Employee Health Services guidelines, education, and training requirements, and other applicable governing standards such as Occupational Safety and Health Administration (OSHA), Department of Health Reportable Diseases, etc. is also expected.

XXV. Case Documentation

Documentation of cases and procedures, as mandated by Residency Review Committee (RRC) and program essentials, is a requirement of the MSGME appointment. Residents who do not maintain accurate and up-to-date case documentation will not advance to the next level of training or be allowed to complete their residency program until compliance is achieved.

XXVI. Certificate

Upon satisfactory completion of the training program, the resident will be eligible for an MSGME certificate and an alumni certificate. Mayo does not impose restrictive practice covenants upon its graduates.

For questions or further details regarding these policies, contact Mayo School of Graduate Medical Education at msgme@mayo.edu.

Implementation: Longstanding

Last Review Date: November 2005

Next Review Date: November 2007

Reviewed By: GMEC

Contact: GMEC Secretary

Contact Ginny Allie, 4-0349, with questions regarding this page. Last updated: 21-Nov-2006

Attachment 17. MSGME Probation and Dismissal Policy*

I. Purpose

It is the goal of the Mayo Clinic College of Medicine that appointees successfully complete training in a field consistent with their interests and capabilities. Appointments may be extended at the option of the program to enable the appointee to satisfactorily complete the program. An appointee may receive a formal warning of deficiency or may be placed on probation and be dismissed for significant, documented deficiencies following appropriate due process.

II. Policy

1. Two types of behavior warrant disciplinary action:
    - Academic Deficiency - This includes documentation of: (a) insufficient medical or scientific knowledge or lack of appropriate technical skills, (b) inability to use medical or scientific knowledge effectively, either in patient care or in research, or (c) any other deficiency that bears on an individual's performance.
    - Other (Non-Academic) Deficiency - This includes violation of any of the following: professional responsibility, school or institutional rules, civil law or criminal law. Such deficiencies may be of sufficient magnitude to warrant immediate dismissal. The following examples would be within the definition of "other deficiency":
        - Harassment, lying or cheating.
        - Unauthorized use, possession, dispensing, disposal or introduction of drugs, narcotics, medications or other substances regulated by law into or on Mayo property.
        - Unauthorized possession or consumption of alcoholic beverages during or before periods of work or on Mayo's premises.
        - Unauthorized disposal or theft of Mayo property or the property of other students, employees, or patients, or the conversion of such property to personal use.
        - Failure to qualify for required licensure/certification.
        - Breaches of patient confidentiality (HIPAA)
2. Disciplinary Actions

    Any academic or other deficiency could result in either a formal warning or probation and may lead to dismissal. The Program Director or school representative must discuss the concerns with the appropriate Dean or Associate Dean prior to determining the course of disciplinary action.

    a. Formal Warning of Deficiency - A department/school may issue a formal warning in lieu of, or preliminary to, invoking probation. A formal warning should include:

* The policy was copied from the intranet <http://mayoweb.mayo.edu/mccm-policies/probation-dismissal.html>, May 2007.

- A clear description of academic or non-academic deficiencies, citing examples of performance or behavior problems, and referencing previous discussions and documentation of the problems, if any.
- A remedial plan with suggestions to improve performance or behavior.
- Next course of action and timeline.
- Signatures from the resident/student and the Program Director and/or Dean.

The warning becomes part of the individual's school record, but is removed if the deficiency is fully remediated. The Associate Dean determines whether the formal warning document should be removed immediately after remediation or if it should remain in the file until the resident/student completes Mayo training. Probation, followed by dismissal, will likely result if unsatisfactory performance continues following such a warning.

b. Probation - Academic Deficiency – When performance is below acceptable standards, as defined by each school, the resident/student will be informed in writing by the Department Chair, Associate Dean or Program Director that he/she has been placed on probation. Probation begins with the date of notification. A plan for remediation, which includes the items in a formal warning, should be provided to the resident/student, along with a copy of these guidelines, and sent to the appropriate Associate Dean. The minimum probationary period is three months for programs of at least twelve months duration. The minimum probationary period may be less than three months for programs of less than twelve months duration. At the end of the probationary period, the Department Chair or Program Director will choose one of the following actions:

- Remove the resident/student from probationary status
- Extend the probationary period
- Recommend dismissal of the resident/student

The Associate Dean must be informed of this action.

c. Probation - Other (Non-Academic) Deficiency – When other deficiencies are identified by the Department Chair and/or Program Director, the matter will be promptly referred in writing to the appropriate Associate Dean. Upon completion of the review, the resident/student will be informed of the decision concerning appointment continuation by the Associate Dean.

d. Dismissal - If the Program/Department recommends dismissal, the resident/student will have three business days to elect one of three options:

- Accept the dismissal.
- Submit a resignation, effective at a mutually acceptable date. Resignation precludes appeal.
- Appeal to the Dean to review the dismissal.

3. Appeal of Dismissal for Academic and Non-Academic Deficiency

All appeals should be submitted to the Dean of the school in writing. The Dean will appoint members to an Appeal Committee and will Chair the Committee.

Persons with information about the deficiency will be asked to attend the hearing to relate the facts. All relevant academic records will be made available. The appeal hearing will proceed only if the resident/student appears before the Appeal Committee. Attorneys representing either the resident/student or Mayo do not attend the hearing. The decision of the Appeal Committee will be one of two options:

- Uphold the appeal and return the resident/student to probationary status with a written remediation plan
- Dismissal

In all cases of appeal, the decision of the Appeal Committee is final. The Grievance Policy is not available for further appeal.

4. Reference Requests

   The Program Director must provide the Associate Dean with a written report summarizing the outcome of the probation/formal warning of deficiency. This report will be used as the basis to respond to future reference inquiries. The report should contain information that will address questions about the resident's/student's performance relative to any disciplinary/remedial proceedings and should include a balanced view of performance for the entire program. The report must be reviewed by the Legal Department prior to placement in the file.

III. Related References

- Grievance (link to grievance policy)
- MSGME Ombudsperson (links for Arizona, Jacksonville, Rochester)

Implementation Date: Longstanding
Last Review Date: April 2005
Next Review Date: April 2006

Reviewed by: GMEC, MGSEC, MMSEC, MSHSEC, Administrative Committee of Mayo Clinic Education Committee

Contact: Secretary of Administrative Committee of Mayo Clinic Education Committee

Attachment 18. Clinical Medical Physics Residency Rotation Evaluation Form

At the end of each rotation, the resident is asked (by the educational coordinator) to submit an evaluation form regarding the rotation. Filling in the form is voluntary, and forms can be printed or submitted via email to Dr. Y.I. (Nina) Garces, who assists the program by tabulating the results and attempting to assure anonymity of the responses. Results are forwarded to the program executive committee on an annual basis in time for the annual program evaluation, which occurs in mid to late June of each year.

MAYO CLINIC
Radiation Oncology
Physics Education

Medical Physics Residency Rotation Evaluation

Thank you for taking the time to fill out this evaluation form. This form is to be completed by each Physics Resident/Fellow following each rotation, and is designed to gather feedback on specific rotations of the Mayo Clinic Radiation Therapy Medical Physics Residency Program. Click the "Submit by Email" button to submit the survey. The form data will be attached to an email message in your default email program. The email will be addressed to the Physics Residents' Advocate (currently Dr. Nina Garces) and her administrative assistant (Cindy Chapman) by default, who will compile the results and present them to the Chief of the Division of Medical Physics and the Physics Residency Program Director. Reasonable efforts to retain anonymity will be made.

Rotation _____

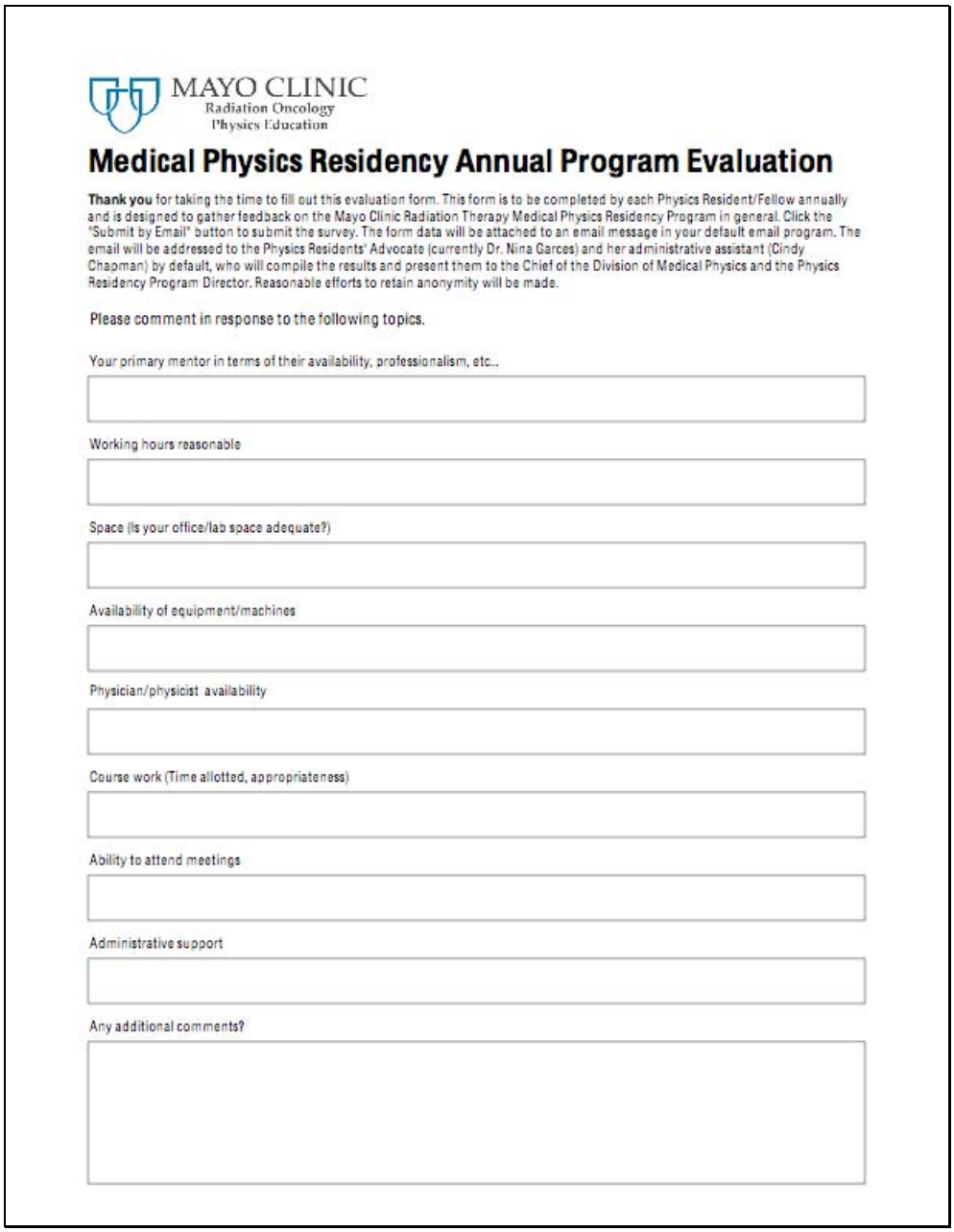
	not at all 1	2	neutral 3	4	definitely 5
1. Was the training covered by this rotation enough to provide you with the knowledge required for you to accomplish your clinical duties?	○	○	○	○	○
2. Were didactic materials (e.g. books, lectures, etc...) adequate?	○	○	○	○	○
3. Were the overlapping rotations and clinical duties arranged so that you can accomplish the requirements of this rotation in a timely manner?	○	○	○	○	○
4. Was the mentorship adequate to allow you to perform the clinical and administrative duties?	○	○	○	○	○
5. Was the availability of the rotation mentor adequate?	○	○	○	○	○
6. Was the rotation mentor's knowledge of the subject appropriate?	○	○	○	○	○

	not at all 1	2	once per week 3	4	every day 5
7. How often did you seek the aid of your rotation mentor?	○	○	○	○	○
8. How often did you seek your primary mentor in regards to this subject **before** asking for the aid of the rotation mentor?	○	○	○	○	○
9. How often did you seek your primary mentor in regards to this subject **after** asking for the aid of the rotation mentor?	○	○	○	○	○

10. How can the this rotation be improved? Please type in any addition comments you would like to communicate.

Attachment 19. Clinical Medical Physics Annual Program Evaluation Form

An annual evaluation of the program by the residents is carried out each year (late May), just prior to the arrival of new incoming residents and fellows at the beginning of July. Residents and fellows are asked (by the educational coordinator) to submit an evaluation form. Filling in the form is voluntary, and forms can be printed or submitted via email to Dr. Y.I. (Nina) Garces, who assists the program by tabulating the results and attempting to assure anonymity of the responses. Results are forwarded to the program executive committee on an annual basis in time for the annual program evaluation, which occurs in mid to late June of each year.



MAYO CLINIC
Radiation Oncology
Physics Education

Medical Physics Residency Annual Program Evaluation

Thank you for taking the time to fill out this evaluation form. This form is to be completed by each Physics Resident/Fellow annually and is designed to gather feedback on the Mayo Clinic Radiation Therapy Medical Physics Residency Program in general. Click the "Submit by Email" button to submit the survey. The form data will be attached to an email message in your default email program. The email will be addressed to the Physics Residents' Advocate (currently Dr. Nina Garces) and her administrative assistant (Cindy Chapman) by default, who will compile the results and present them to the Chief of the Division of Medical Physics and the Physics Residency Program Director. Reasonable efforts to retain anonymity will be made.

Please comment in response to the following topics.

Your primary mentor in terms of their availability, professionalism, etc...

Working hours reasonable

Space (Is your office/lab space adequate?)

Availability of equipment/machines

Physician/physicist availability

Course work (Time allotted, appropriateness)

Ability to attend meetings

Administrative support

Any additional comments?

Attachment 20. Orientation Schedule Example

Resident Program Director: John A. Antolak, Ph.D. **Education Coordinator:** Elaine Eckheart (507) 284-4655

2007 Radiation Oncology Resident Orientation Schedule

C. Deufel, Ph.D.

	Monday, July 2	Tuesday July 3	Wednesday, July 4	Thursday, July 5	Friday, July 6
7:00	**MSGME Orientation (7:00 - 4:30)** Siebens, Phillips Hall		 HAPPY HOLIDAY!		
7:30					**Computer Session C (7:30 - 9:30)** Gonda 17
8:00		**Case Conference (8-9)** Charlton S-112		**Case Conference (8-9)** Charlton S-112	
8:30					
9:00		**Department Tour** Dr. Herman **(9-10)** *He will meet you in Charlton S-112		**Time for Mandatory Online Training (9-10:30)** Your Desk	
9:30					
10:00		**Education Coordinator (10-11)** Charlton-S-112			
10:30				**Orientation to Rad Onc Physics** Dr. Herman **(10:30-12)** Charlton S-243	
11:00					
11:30					
12:00		Lunch		Lunch with Dr. Herman	**Professionalism** Dr. Stolp **(12-2)** *Lunch Provided Siebens 402
12:30					
1:00					
1:30		**Computer Session A (1:30-4:30)** Ozmun Center 3-15			
2:00				**Library Intro** Dottie Hawthorne **(2-3)** Plummer 1440	**IMPAC Training** Dr. Laack **(2-3)** Charlton Rad Onc U Room
2:30					
3:00					**CT Sim Training** Dr. Laack **(3-5)** Charlton Rad Onc U Room
3:30				**Intro to Physics** Dr. Herman **(3:30-5)** Charlton-S-243	
4:00					
4:30					
5:00					

2007 Radiation Oncology Resident Orientation Schedule

C. Deufel, Ph.D.

	Monday, July 9	Tuesday, July 10	Wednesday, July 11	Thursday, July 12	Friday, July 13
7:30	**QA Conference (7:30-9:00)** Charlton S-112				
8:00		**Case Conference (8-9)** Charlton S-112	**Oncology Core Curriculum (8-9)** Gonda 10-101	**Case Conference (8-9)** Charlton S-112	**Case Conference (8-9)** Charlton S-112
8:30					
9:00	**Desk R Intro** (Jeff Anderson) Charlton Appointment Desk		**618F (9-12)** Charlton S-220	**610B (9-12)** Charlton S-278	
9:15	**Secy / DVI** (Gloria Keene) Charlton S-243				
9:30	**Tx Policies/Procedures SIM Intro (9:30-11)** Charlton S-213				
10:00					
10:30					
11:00	**Dosimetry Intro** Janelle Miller **(11-12)** Charlton S-232E				
11:30					
12:00	Lunch	Lunch	Lunch	Lunch	Lunch
12:30					
1:00	**Block Fabrication (1-1:30)** Charlton S-245C				
1:30		**Physics Conference (1:30-2:30)** Charlton S-112	**SIM 2 (1-3:30)** Charlton S-255		
2:00	**Nursing Intro** Mary Burk **(2-3)** Charlton S-204A				
2:30					
3:00					
3:30	**Intro to Physics** Dr. Kruse **(3:30-5)** Charlton-S-243		**Intro to Physics** Dr. Kline **(3:30-5)** Charlton-S-243	**Intro to Physics** Dr. Brinkmann **(3:30-5)** Charlton-S-243	**Intro to Physics** Dr. Antolak **(3:30-5)** Charlton-S-243
4:00					
4:30					
5:00					

Attachment 21. Compensation and Benefits

Mayo-provided benefits and insurance programs are available to those appointed to programs at least one year in length. The information shown below is available on the internet at <http://www.mayo.edu/msgme/benefits.html>.

I. Stipend

The following table shows the resident and fellow educational stipends for the 2008-2009 academic year (effective June 25, 2008).

Program	Annual
PGY-1	$46.063
PGY-2	$47,907
PGY-3	$49,890
PGY-4	$51,976
PGY-5	$54,218
PGY-6	$56,280
PGY-7	$58,152
PGY-8	$60,397
PGY-9	$62,575
PGY-10	$64,734

II. Mayo Clinic Paid Benefits

- Vacation (15 working days per year)
- Short-term disability (sick leave up to three months)
- Dental assistance plan

III. Insurance Programs

- Comprehensive medical care plan
- Voluntary basic life insurance, disability insurance, and family life insurance
- Voluntary additional life insurance
- Voluntary accidental death and dismemberment insurance
- Excess personal liability insurance

IV. Other Benefits

- Dependent and health-care reimbursement accounts
- Adoption reimbursement
- Paid and unpaid leaves of absence
- Tax-deferred annuity plans
- Meal subsidy for on-call residents
- Parking and inter-campus bus shuttle

V. Services and Support Groups

Mayo Clinic offers many services to assist you during your residency and/or fellowship training program. Many, but not all, of the services shown are available at all three Mayo sites (Jacksonville, Fla.; Rochester, Minn.; and Scottsdale, Ariz.). However, all are accessible within the Mayo system.

- Minority Student Affairs Office: For help with questions and concerns regarding minority issues and community relations, contact Juan M. Bowen, M.D., minority affairs director, Mayo School of Graduate Medical Education, (507) 284-4339.
- Mayo Fellows Associations: These organizations are dedicated to maintaining excellence in residency education and encouraging closer social and professional relationships among members.
- Financial and Insurance Counseling: Advisers are available to help with personal financial questions.
- Employee Assistance Program: A Mayo service providing professional, confidential assistance for your professional or personal problems.
- Employment Opportunities: Guidance is available for your spouse/significant other interested in employment opportunities.
- Childcare Referral: Provides services to families and referrals to childcare and preschool programs.
- Child Illness Care: Mayo will provide help with caring for your ill child.
- Activities Program: Special events and services are offered in four areas: social/family, culture, recreation and education.
- Alice Mayo Society: Organizes social events and activities for spouses of staff members, female physicians and non-medical female staff members

Attachment 22. Key Divisional Faculty

Physics Faculty	Faculty Rank	Board Certification	Year Appointed
John A. Antolak, Ph.D.	Assoc. Professor	ABR(96)	2004
Debra A. Brinkmann, Ph.D.	Instructor	ABR(02)	2000
Keith M. Furutani, Ph.D.	Lecturer	CCPM(04), ABR(05)	2003
Michael G. Herman, Ph.D.	Assoc. Professor	ABMP(94)	1998
Robert W. Kline, Ph.D.	Assoc. Professor	ABR(79)	1986
Jon J. Kruse, Ph.D.	Instructor	ABR(05)	2002
C. Robert Blackwell, MSc.	Asst. Professor	ABR(88)	1985
Robert A. Dahl, M.Sc.	Instructor	ABR(91)	1987
Andrew R. Jensen, M.S.		ABR(in progress)	
Kevin P. McCollough, M.Sc.	Asst. Professor	ABR(94)	1991
Luke B. McLemore, M.Sc.	Instructor	ABR(03)	2000
Janelle M. Miller, R.T.(T)(R)	----	CMD(00)	1994

Radiation Oncology Physician (M.D.) Faculty	FTE
Rochester, MN	14.65
Mankato, MN	2
Albert Lea, MN	1
La Crosse, WI	1
Eau Claire, WI	1

Radiobiology Faculty	FTE
Larry Karnitz, Ph.D.	1
Jann Sarkaria, M.D.	0.75

Attachment 23. Faculty Biographies

John A. Antolak, Ph.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Teaching/Examining Privileges in Biomedical Engineering - Mayo Graduate School	09/28/2005 - Present
Associate Professor of Radiologic Physics - College of Medicine, Mayo Clinic	01/01/2006 - Present
Consultant - Department of Radiation Oncology, Mayo Clinic, Rochester, Minnesota	08/02/2007 - Present
Senior Associate Consultant - Department of Radiation Oncology, Mayo Clinic, Rochester, Minnesota	2004 - 08/01/2007
Assistant Professor - Department of Radiation Physics, M.D. Anderson Cancer Center, University of Texas, Houston, Houston, Texas	1998 - 2004
Assistant Professor - Graduate School of Biomedical Sciences, University of Texas, Houston, Houston, Texas	1998 - 2004
Junior Medical Physicist - Department of Radiation Physics, M.D. Anderson Cancer Center, University of Texas, Houston, Houston, Texas	1992 - 1993
Medical Physicist - Department of Medical Physics, W.W. Cross Cancer Institute, Edmonton, Alberta, Canada	1992

Licensure and Board Certification

American Board of Radiology, Therapeutic Radiologic Physics, 1996

Education and Training

University of Alberta BSc, Physics (honors)	1979 - 1983
University of Alberta MSc, Physics (Nuclear Magnetic Resonance)	1983 - 1985
University of Alberta Ph.D, Physics (Medical Physics)	1989 - 1992
M.D. Anderson Cancer Center, University of Texas, Houston Postdoctoral Training, Clinical Medical Physics. Dr. Kenneth R. Hogstrom	1992 - 1993
Additional Education	
2-day review course AAPM Medical Physics Review Course in Radiotherapy Detroit, Michigan	07/1987
1-week Short Course entitled “Dosimetry of High Energy Electron and X-ray Therapy Machines” The University of Texas M.D. Anderson Cancer Center Houston, Texas	02/1991
1-week Short Course entitled “Anatomy for Radiotherapy Treatment Planning” The University of Texas Health Science Center at San Antonio San Antonio, Texas	03/1993

Teaching Experience (last 10 years)

Total Body Irradiation (1 hour)Dosimetry of High Energy Electrons and X-Ray Therapy Machines (short course) The University of Texas MD Anderson Cancer Center Houston, Texas	1995 - 2001
Fetal Dose (0.5 hours) Dosimetry of High Energy Electrons and X-Ray Therapy Machines (short course) The University of Texas MD Anderson Cancer Center Houston, Texas	1996 - 2001
Special Procedure Demos (2 hours) Dosimetry of High Energy Electrons and X-Ray Therapy Machines (short course) The University of Texas MD Anderson Cancer Center Houston, Texas	1996 - 2001
Total Skin Electron Irradiation (1 hour) Dosimetry of High Energy Electrons and X-Ray Therapy Machines (short course) The University of Texas MD Anderson Cancer Center Houston, Texas	1996 - 2001
Mathematics for Medical Physics, GS020183 Instructor, Fall semester (2 contact hours) University of Texas Graduate School of Biomedical Sciences Houston, Texas	1997 - 2003
Total Body Irradiation Lecture to RTT students (1 hour), 7/10/97, 7/15/98, 5/26/99, 7/8/03 The University of Texas M. D. Anderson Cancer Center, School of Health Sciences Houston, Texas	1997 - 2003
Total Skin Electron Irradiation Lecture to RTT students (1 hour), 7/9/97, 7/13/98, 5/24/99, 7/8/03 The University of Texas M. D. Anderson Cancer Center, School of Health Sciences Houston, Texas	1997 - 2003
Physics and Applications of Electron Beam Transport, GS020131 Instructor (2-3 hours) University of Texas Graduate School of Biomedical Sciences Houston, Texas	1998 - 2002
Radiation Detection, Instrumentation, and Data Analysis, GS020053 Lab Instructor, 1998 (12 contact hours) Course Coordinator, 1999-2004 (16-50 contact hours per year) University of Texas Graduate School of Biomedical Sciences Houston, Texas	1998 - 2004
Total Skin Electron Irradiation Lecture to Radiation Oncology Residents (1 hour) The University of Texas M. D. Anderson Cancer Center Houston, Texas	05/26/1999
Medical Physics Seminar, GS020731 Instructor (1 contact hour) University of Texas Graduate School of Biomedical Sciences Houston, Texas	2000 - 2002

Special Projects: Research, GS000530 Coordinator, (Dee-Ann Radford) (10 contact hours) University of Texas Graduate School of Biomedical Sciences Houston, Texas	2000
IMRT Commissioning (1 hour) Dosimetry of High Energy Electrons and X-Ray Therapy Machines (short course) The University of Texas MD Anderson Cancer Center Houston, Texas	09/18/2000 - 09/22/2000
Introduction to Radiation Protection, GS020133 Instructor (1 contact hour) University of Texas Graduate School of Biomedical Sciences Houston, Texas	2001 - 2003
Total Body Irradiation & Total Skin Electron Irradiation (1.75 hours) 03/21/2001, 08/09/2001, 04/19/2002, 08/08/2002, 03/27/2003, 07/31/2003 External Beam Dosimetry: Basic Methods and Calculations (short course) The University of Texas MD Anderson Cancer Center Houston, Texas	2001 - 2003
Treatment Planning: Clinical Electrons 1 hour Lecture American Association of Physicists in Medicine Therapy Physics Review Course	2002 - Present
IMRT Special Topics: Monte Carlo 04/20/2002, 09/21/2002 (0.5 hour lecture) IMRT: Principles & Practice (short course) The University of Texas M. D. Anderson Cancer Center Houston, Texas	2002
IMRT Treatment Planning Practicum 04/19/2002, 09/20/2002, 04/11/2003 (3 hours) IMRT: Principles & Practice (short course) The University of Texas M. D. Anderson Cancer Center Houston, Texas	2002 - 2003
Treatment Delivery Techniques and Specifications 04/18/2002, 09/19/2002, 04/10/2003 (0.75 hour lecture) IMRT: Principles & Practice (short course) The University of Texas M. D. Anderson Cancer Center Houston, Texas	2002 - 2003
Treatment Accessories Radiation Therapy Registry Review (1.5 hours) The University of Texas M. D. Anderson Cancer Center, School of Health Sciences Houston, Texas	08/05/2003
Medical Physics for Radiation Oncology Residents Course Coordinator and Major Lecturer Mayo Clinic Department of Radiation Oncology Rochester, Minnesota	2004 – Present
BME 5160: Introduction to Radiation Physics Instructor, Mayo Graduate School	2005 – Present

Fellows, Residents and Graduate Students Preceptored

Bawiec, E.R. (Graduate Student) 1992 - 1994
Description: Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences

Fischer, Teresa (Graduate Student) 1997 - 1998
Description: Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences

Bieda, Michael (Graduate Student) 1997 - 1999
Description: Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences, 1997
Chairman, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences, 1997-1999

Zacharopoulos, Nicholas (Ph.D. Student) 1998 - 2000
Description: Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences

McCullough, Stephen (Ph.D. Student) 1998 - 2000
Description: Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences

Gifford, Kent (Graduate Student) 1998 - 2001
Description: Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences, 1998-1999
Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences, 1999-2001

Boyd, Robert A (Ph.D. Student) 1998 - 2001
Description: Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences

Parker, Brent C (Graduate Student) 1998 - 2001
Description: Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences, 1998-1999
Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences, 1999-2001

Cherry, Christopher (Graduate Student) 1998 - 2002
Description: Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences, 1998-1999
Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences, 1999-2002

Garcia, John (Undergraduate Student) 1999
Description: The University of Texas M. D. Anderson Cancer Center, School of Allied Health, Dosimetry Student Research Project

McLemore, Luke B (Graduate Student) 1999 - 2000
Description: Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences

Radford, Dee-Ann (Graduate Student) 1999 - 2001
Description: Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences

Price, Michael (Graduate Student) 2001 - 2004
Description: Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences

Rodgers, Robert A (Graduate Student) **Description:** Chairman, Advisory Committee, University of Texas Graduate School of Biomedical Sciences 2001-2002 Chairman, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences 2002-2005	2001 - 2005
Weinberg, Rebecca (Ph.D. Student) **Description:** Chairman, Advisory Committee, University of Texas Graduate School of Biomedical Sciences, 2002-2004 Chairman, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences, 2005-2007	2002 - 2007
Arzu, Dorita (Medical Resident) **Description:** University of Texas M. D. Anderson Cancer Center, Radiation Oncology Resident Research Project	2002 - 2003
Chi, Pai Chun (Melinda) (Graduate Student) **Description:** Member, Advisory Committee, University of Texas Graduate School of Biomedical Sciences 2002 Member, Supervisory Committee, University of Texas Graduate School of Biomedical Sciences 2002-2004	2002 – 2004
Abou Mourad, Houssam (Medical Physics Resident)	7/2005 – 12/2006
Deufel, Christopher (Medical Physics Resident)	7/2007 – Present

Clinical Experience

External beam radiation therapy for more than 15 years.

Primary Clinical and Service Responsibilities

Treatment planning system quality assurance, Electron radiation therapy, Physicist of the Day (POD), Plan Check, Respiratory-correlated imaging and radiation therapy IMRT QA

Description of Research Interests

Electron conformal therapy, Respiratory-correlated imaging and radiation therapy, Monte Carlo methods for radiation transport

Selected Publications in Refereed Journals in Past 5 years

1. Kudchadker RJ, Antolak JA, Morrison WH, Wong PF, Hogstrom KR. Utilization of custom electron bolus in head and neck radiotherapy. J Appl Clin Med Phys 2003; 4(4):321-33.
2. Dong L, Antolak J, Salehpour M, Forster K, O'Neill L, Kendall R, Rosen I. Patient-specific point dose measurement for IMRT monitor unit verification. Int J Radiat Oncol Biol Phys 2003 Jul 1; 56(3):867-77.
3. Kainz KK, Hogstrom KR, Antolak JA, Almond PR, Bloch CD, Chiu C, Fomytskyi M, Raischel F, Downer M, Tajima T. Dose properties of a laser accelerated electron beam and prospects for clinical application. Med Phys 2004; 31(7):2053-67.
4. Hogstrom KR, Boyd RA, Antolak JA, Svatos MM, Faddegon BA, Rosenman JG. Dosimetry of a prototype retractable eMLC for fixed-beam electron therapy. Med Phys 2004 Mar; 31(3):443-62.
5. Chi PC, Hogstrom KR, Starkschall G, Antolak JA, Boyd RA. Modeling skin collimation using the electron pencil beam redefinition algorithm. Med Phys 2005; 32(11):3409-3418.
6. Fitzpatrick MJ, Starkschall G, Balter P, Antolak JA, Guerrero T, Nelson C, Keall P, Mohan R. A novel platform simulating irregular motion to enhance assessment of respiration-correlated radiation therapy procedures. J Appl Clin Med Phys 2005; 6(1):13-21.
7. Kainz KK, Antolak JA, Almond PR, Bloch CD, Hogstrom KR. Dual scattering foil design for poly-energetic electron beams. Phys Med Biol 2005; 50(5):755-67.
8. Nelson C, Starkschall G, Baiter P, Fitzpatrick MJ, Antolak JA, Tolani N, Prado K. Respiration-correlated treatment delivery using feedback-guided breath hold: a technical study. Med Phys 2005; 32(1):175-81.
9. Kainz KK, Hogstrom KR, Antolak JA, Almond PR, Bloch CD. Dose properties of x-ray beams produced by laser-wakefield-accelerated electrons. Phys Med Biol 2005 Jan 7; 50(1):N1-10.

10. Fitzpatrick MJ, Starkschall G, Antolak JA, Fu J, Shukla H, Keall PJ, Klahr P, Mohan R. Displacement-based binning of time-dependent computed tomography image data sets. Med Phys 2006 Jan; 33(1):235-46.
11. Popple RA, Weinberg R, Antolak JA, Ye SJ, Pareek PN, Duan J, Shen S, Brezovich IA. Comprehensive evaluation of a commercial macro Monte Carlo electron dose calculation implementation using a standard verification data set. Med Phys 2006 Jun; 33(6):1540-51.
12. Chi PC, Hogstrom KR, Starkschall G, Boyd RA, Tucker SL, Antolak JA. Application of the electron pencil beam redefinition algorithm to electron arc therapy. Med Phys 2006 Jul; 33(7):2369-83.
13. Kry SF, Starkschall G, Antolak JA, Salehpour M. Evaluation of the accuracy of fetal dose estimates using TG-36 data. Med Phys 2007 Apr; 34(4):1193-7.
14. Mutaf YD, Antolak JA, Brinkmann DH. The impact of temporal inaccuracies on 4DCT image quality. Med Phys 2007 May; 34(5):1615-22.

Selected Books, Chapters Published in Past 5 years

1. Hogstrom KR, Antolak JA, Hanson WF, Horton JL, Rosen II, Shiu AS, Starkschall G. Clinical radiation physics. In: Cox JD, Ang KK, editors. Radiation oncology: rationale, technique, results. 8 Edition. St. Louis, MO: Mosby, Inc.; 2003. p. 63-96.
2. Hogstrom KR, Antolak JA, Kudchadker RJ, Ma CM, Leavitt DD. Modulated electron therapy. In: Palta JR, Mackie TR, editors. Intensity-Modulated Radiation Therapy: the State of the Art. Madison, WI: Medical Physics Publishing; 2003. p. 749-86.
3. Starkschall G, Shukla H, Keall PJ, Antolak JA, Mohan R. Displacement-based binning of 4-D CT image data sets. In: Yi BY, Ahn SD, Choi EK, Ha SW. Proceedings of the XIV International Conference on the Use of Computers in Radiation Therapy. Seoul, Korea: Jeong Publishing; 2004. p. 53-6.

Resident Training Responsibilities

Directory, Radiation Oncology Clinical Medical Physics Residency, 2007-present
Mentor: Treatment Planning Commissioning, POD, Plan Check, IMRT QA

Pertinent Committee Service

Department of Radiation Oncology Education Committee, 2004 – present
Division of Medical Physics Residency Program Executive Committee, 2004 – present
CAMPEP Residency Program Review Committee, 2004 – present
UT GSBS Medical Physics Graduate Program Steering Committee, 1998 – 2004
UT MD Anderson Cancer Ctr Credentialing Committee for the Med. Staff, 2002 – 2004
UT MD Anderson Cancer Ctr Faculty Senate, 2003 – 2004
AAPM Meeting Coordination Committee, 2007 – present
Chair, AAPM Analysis and Evaluation Subcommittee, 2007 – present
ACMP Commission on Professional Practice, 2001 – 2004

C. Robert Blackwell, M.S.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Clinical Medical Physicist, Department of Oncology, Division of Radiation Oncology, Mayo Clinic, 1985 - Present.

Assistant Professor of Radiologic Physics, Mayo Medical School, 1992 – Present.

Associate Staff Appointment, Division of Radiation Oncology 1992 - Present
Mayo Clinic/Foundation, Rochester, MN

Licensure and Board Certification

American Board of Radiology, Therapeutic Radiological Physics, 1988.

Florida – Therapeutic Radiological Physicist – TRP-0000083

Education and Training

University of North Carolina, Asheville, 1976 – 1980; BA Physics.

University of South Carolina, Columbia, 1980 – 1982, MS Physics.

University of North Carolina, Chapel Hill, 1983 – 1984, MSPH Radiological Hygiene

Mayo Graduate School, 1991 – 1994, MS Biomedical Sciences.

Varian Medical Systems – Linear Accelerator Maintenance I., December 1986.

American Association of Physicists in Medicine, summer school - Radiation oncology Physics. July 1986.

Atomic Energy of Canada Limited (AECL) Theraplan Users Course, April 1987.

American Association of Physicists in Medicine, summer school – Brachytherapy Physics, July 1994.

Teaching Experience

Mayo Graduate School

Clinical physics instruction - Qing Rong Wu, 1993, Biophysics Program
Hui Helen Liu, 1994, Biophysics Program

Mayo School of Health Related Sciences

Physics didactic instruction
Mayo Program in Radiation Therapy Technology, 1985 – present

Coordinator of Physics Curriculum
Mayo Program in Radiation Therapy Technology, 1989 – present.

Admissions/Advisory Committee
Mayo Program in Radiation Therapy Technology, 1991 – present.

Other

Summer graduate student interns - Clinical physics instruction

Chris Endres – 1988
Sandra Zmuda – 1989
Scott Simons - 1990
Tony Murphy - 1991
Derek Shickell - 1993
Mark Young - 1994
Aaron Blanchard – 1995
Klaudia Meyer - 1997

Primary Clinical and Service Responsibilities

Responsible for supervision of all treatment machine quality assurance, calibration and maintenance activities within the Division of Radiation Oncology, Mayo Clinic/Foundation.

Responsible for technical development, supervision of, and participation in, the prostate brachytherapy program within the Division of Radiation Oncology, Mayo Clinic/Foundation.

Clinical physics duties within the Division of Radiation Oncology, Mayo Clinic/Foundation, including: patient treatment plan reviews prior to treatment, weekly patient chart reviews, TBI, TSET, IORT, Gamma Knife, Prostate, Intravascular and LDR Brachytherapy, special patient measurements and outreach supervision of physics for Mankato, MN Radiation Oncology facility.

Description of Research Interests

Gamma Knife Treatment
Electron Beam Dosimetry
Radiation Treatment of Pregnant Women

Selected Publications in Refereed Journals in Past 5 years

1. "Radiochromic Film Dosimetry: Recommendations of AAPM Radiation Therapy Committee Task Group 55." A. Niroomand-Rad, C.R. Blackwell, B. Coursey, K. Gall, J. Galvin, W. McLaughlin, A. Meigooni, R. Nath, J. Rodgers, C. Soares. Med. Phys. 25(11), Nov., 1998

Selected Books, Chapter Published in Past 5 years

Resident Training Responsibilities

Physics instruction in Quality Assurance.

Pertinent Committee Service

American Association of Physicists in Medicine (AAPM)
Member - AAPM Computer Applications Task Group 23
Co-Chairman - AAPM Fetal Dose Task Group 36
Member - AAPM Radiochromic Film Dosimetry Task Group 55
Member/Chair of Radiotherapy Subcommittee – AAPM-HPS Fetal Dose Task Group writing ANSI report

Mayo Clinic
Associate Staff Appointment Committee

Debra H. Brinkmann, Ph.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Consultant, Department of Radiation Oncology, Mayo Clinic
Instructor of Radiologic Physics, Mayo Medical School

Licensure and Board Certification

2002 American Board of Radiology, Therapeutic Radiological Physics

Education and Training

2000 Residency in Radiation Oncology Physics, Mayo Graduate School of Medicine, Rochester MN
1998 Ph.D. Biomedical Sciences, Mayo Graduate School, Rochester MN
1993 B.S. Physics, North Park College, Chicago IL

Teaching Experience

2001 – Mayo School of Health Sciences: Radiation Therapy Technology Program, Physics didactic instruction
2002 – Mayo Graduate School of Medicine: Radiation Oncology Physics Residency and Fellowship, Clinical radiation therapy physics training
2004 – Mayo Graduate School of Medicine: Radiation Oncology Medical Residency, Physics lectures on Stereotactic Radiosurgery/Radiotherapy, CT, MR, PET, and Virtual Simulation

Fellows, Residents and Graduate Students Preceptored

Yildirim D. Mutaf, Ph.D.

Clinical Experience

2003 – Senior Associate Consultant, Consultant Physicist, Department of Radiation Oncology, Mayo Clinic, Rochester MN
2000 - 2003 Clinical Physicist, Division of Radiation Oncology, Mayo Clinic, Rochester MN
1998 - 2000 Residency in Radiation Oncology Physics, Mayo Graduate School of Medicine, Rochester MN

Primary Clinical and Service Responsibilities

Special Procedures: Stereotactic Body Radiosurgery/Radiotherapy with either Cone Beam CT or ExacTRAC kV localization and BodyFix immobilization, Fractionated Cranial Stereotactic Radiotherapy with BrainLab ExacTRAC system, Stereotactic Radiosurgery with Leksell Gamma Knife

Routine Procedures: Plan checks, Chart checks, Machine triage, Virtual simulation triage, CT simulation QA, 4DCT

Service: Clinical Practice lead of the Division of Medical Physics of the Department of Radiation Oncology, Simulation group lead, Brainlab and SBRT core group lead, Clinical administration oversight of Mankato regional practice

Description of Research Interests

Imaging Applications in Radiation Therapy: 4DCT, MR, PET/CT and SPECT/CT for Treatment Planning
Stereotactic Body Radiosurgery / Radiotherapy development: Image-Based Localization and Verification, Respiratory Coaching, Respiratory Gating, Treatment Planning System Comparisons

Selected Publications in Refereed Journals

1. *Mutaf YD, Brinkmann DH. Optimization of Internal Margin to Account for Dosimetric Effects of Respiratory Motion. Int J Radiat Oncol Biol Phys 2008 (accepted, publication date to be determined)

2. *Mutaf YD, Antolak JA, Brinkmann DH. The impact of temporal inaccuracies on 4DCT image quality. Med Phys 2007 May; 34(5):1615-22.

3. Schallenkamp JM, Miller RC, Brinkmann DH, Foote T, Garces YI. Incidence of radiation pneumonitis after thoracic irradiation: Dose-volume correlates. Int J Radiat Oncol Biol Phys 2007 Feb 1; 67(2):410-6.

4. Davis BJ, Brinkmann DH, Kruse JJ, Herman MG, LaJoie WN, Schwartz DJ, Pisansky TM, Kline RW. Selective identification of different brachytherapy sources, ferromagnetic seeds, and fiducials in the prostate using an automated seed sorting algorithm. Brachytherapy 2004; 3(2):106-12.

5. Brinkmann DH, Kline RW. Automated seed localization from CT datasets of the prostate. Med Phys 1998 Sep; 25(9):1667-72.

* Indicates that the primary author was a mentee of this author.

Resident Training Responsibilities

Routine Procedures: plan checks, machine triage, virtual simulation triage, 4DCT, CT simulation QA
Special Procedures: stereotactic radiosurgery
Rotation lead: CT simulation

Pertinent Committee Service

2003 – 2004	Education Committee, Division of Radiation Oncology
2004 -	Clinical Practice Committee, Department of Radiation Oncology
2004 -	Clinical Practice Executive Committee, Department of Radiation Oncology
2005 – 2008	Imaging Physics Committee, American Association of Physicists in Medicine
2005 -	Therapy Imaging Subcomittee, American Association of Physicists in Medicine
2005 -	Working Group “Imaging for Treatment Planning” (Chair) , American Association of Physicists in Medicine
2005 -	Task Group #117 “Use of MRI Data in Treatment Planning and Stereotactic Procedures -- Spatial Accuracy and Quality Control Procedures” (Chair), MR Subcomittee, American Association of Physicists in Medicine
2007 -	RSNA Education Coordination Subcommittee, American Association of Physicists in Medicine
2007 -	Refresher Course Committee, Radiological Society of North America

Robert A. Dahl, M.S.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Clinical medical physicist, Department of Oncology, Division of Radiation Oncology, Mayo Clinic
Instructor of Radiologic Physics, Mayo Medical School

Licensure and Board Certification

American Society of Clinical Pathologists, Medical Technologist, 1985.
American Board of Radiology, Therapeutic Radiological Physics, 1991.
Florida – Therapeutic Radiological Physicist – TRP-0000085

Education and Training

United States Navy, Nuclear Propulsion School, 1976 - 1977.
University of Minnesota, BS in Medical Technology, 1981 - 1985.
University of Kentucky, MS in Radiological Physics, 1985 - 1987.
Varian Medical Systems – Linear Accelerator Maintenance I. January 1989.
North American Hyperthermia Group - Hyperthermia School, May 1990.
American Association of Physicists in Medicine, summer school - Radiation oncology physics. July 1990.
MDS Nordion Theraplan Plus training course. June 1997.
American Association of Physicists in Medicine, summer school - Radiation oncology physics. July 1997.
ESTRO Teaching course – Dose and Monitor Unit Calculations for High Energy Photon Beams. April 1998.
Varian Medical Systems – CadPlan System Administration. June 2001.
Varian medical Systems – Helios/IMRT operations. July 2001.
American Association of Physicists in Medicine, summer school – Intensity Modulated Radiation Therapy. June 2003.
American Brachytherapy Society – School of Breast Brachytherapy. February 2006.
American Brachytherapy Society – School of Prostate Brachytherapy. July 2006.

Teaching Experience

Mayo Graduate School
Clinical physics instruction - Qing Rong Wu, 1993, Biophysics Program
Hui Helen Liu, 1994, Biophysics Program
Mayo School of Health Related Sciences
Physics didactic instruction - Radiation Therapy Technology Program, 1988 - Present
Other
Summer graduate student interns - Clinical physics instruction
Chris Endres - 1988
Sandra Zmuda - 1989
Scott Simons - 1990
Tony Murphy - 1991
Derek Shickell - 1993
Mark Young - 1994
Aaron Blanchard – 1995
Klaudia Meyer - 1997

Clinical Experience

Perform patient hyperthermia treatments.
In charge of physics for total body photon irradiation and intraoperative radiation therapy.
Wrote computer program for calculating the machine setting to deliver the proper patient radiation dose.

Primary Clinical and Service Responsibilities

Total body photon treatment
IORT program physics setup
Participation in all aspects of brachytherapy

Information systems support

Description of Research Interests
IORT development

Selected Publications in Refereed Journals in Past 5 years

Selected Books, Chapter Published in Past 5 years

Resident Training Responsibilities
Physics instruction in hyperthermia physics.

Pertinent Committee Service
American Association of Physicists in Medicine (AAPM)
Member, Task Group 48 – IORT (1995)
Member, Medical Physics Education of Allied Health Professionals (1995 – 2001)
Member, Professional Information and Clinical Relations Committee (1995 – 2004)
Member, Computers Committee (1998 – 2004)
Member, Research Committee (2003 – 2005)
Member, Continuing Professional Development Committee (2004 – Present)
Member, Task Group 127 – MOC (2006- Present)
Member, Finance Committee (2005- Present)
Member, Budget Subcommittee (2007 – Present)

Member, CAMPEP Continuing Education Committee (2008 – Present)

Mayo Clinic Radiation Research Committee

Keith M. Furutani, Ph.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Current: (2003-)
Senior Associate Consultant
Lecturer of Radiologic Physics, Mayo Medical School
Prior: (2000-2003)
Physicist, CancerCare Manitoba
Adjunct Professor, University of Manitoba

Licensure and Board Certification

2005 American Board of Radiology
2004 Canadian College of Physicist in Medicine

Education and Training

1987 B.Sc Honours Physics, University of Manitoba, Winnipeg, Manitoba, Canada
1992 Ph.D. Nuclear Physics, University of Manitoba, Winnipeg, Manitoba, Canada
1995 NSERC PostDoctoral Fellowship in Nuclear Physics at DESY, Hamburg, Germany
2001 Medical Physics Residency, CancerCare Manitoba, Winnipeg, Manitoba, Canada

Teaching Experience

2005-	Teaching Medical and Physics Residents Brachytherapy – Mayo Medical School
2003-2004	Teaching RTTs Brachytherapy and MU Calcs – Mayo School of Health Science
2002-2003	Teaching Radiation Therapy Physics (Khan) – University of Manitoba

Fellows, Residents and Graduate Students Preceptored

Heather Andres MSc

Clinical Experience

2003-2008 All Aspects of Radiation Oncology Clinical Physics including Quality Assurance of Linear Accelerators, Simulation and Brachytherapy, Mayo Clinc
2001-2003 All Aspects of Radiation Oncology Clinical Physics including Quality Assurance of Linear Accelerators, Simulation and Brachytherapy, CancerCare Manitoba

Primary Clinical and Service Responsibilities

2006- Brachytherapy Physics Chair
2003- Lead Clinical Brachytherapy Physicist
2002-2003 Physicist of External Beam Quality Assurance and Dosimetry which included the purchase, installation and commissioning of 4 Accelerators and a R&V System

Description of Research Interests

Conformal radaition Therapy, Image Guided radiation therapy, Dose Calculation Algorithms, Brachytherapy

Selected Publications in Refereed Journals in Past 5 years

1. Su Y, Davis BJ, Furutani KM, Herman MG, Robb RA. Prostate brachytherapy seed reconstruction using an adaptive grouping technique. Med Phys 2007 Jul; 34(7):2975-84.
2. Su Y, Davis BJ, Furutani KM, Herman MG, Robb RA. Dosimetry accuracy as a function of seed localization uncertainty in permanent prostate brachytherapy: increased seed number correlates with less variability in prostate dosimetry. Phys Med Biol 2007 Jun 7; 52(11):3105-19. Epub 2007-05-10.
3. Su Y, Davis BJ, Furutani KM, Herman MG, Robb RA. Seed localization and TRUS-fluoroscopy fusion for intraoperative prostate brachytherapy dosimetry. Comput Aided Surg 2007 Jan; 12(1):25-34.

4. Furutani KM, Miller RC, McLemore LB, Goulet CC, Brinkmann DH, Haddock MG. 4DCT Dosimetric Analysis of the Mayo Clinic Brachytherapy Technique for a Choloangiocarcinoma Patient. Brachytherapy 2006; 5:84.
5. Minehan KJ, Furutani K, McNamara K, Groshek D, Mitchell E, Price M, Emme M, Harms T. Prostate brachytherapy post implant dosimetry: timing matters. J Clin Oncol 2006 Jun; 24(18S):644s.
6. Goulet CC, Davis BJ, Hillman DW, Choo CR, Furutani KM, Mynderse LA, Wilson TM, Herman MG. Comparison of seed migration to the chest after permanent prostate brachytherapy with loose seeds, stranded seeds, or both. Int J Radiat Oncol Biol Phys 2006; 66(3 Suppl):S391.
7. Geometrical Characterization of Prostatic Urethtra from CT Data following Permanent Prostate Brachytherapy: Applications to Trans-Urethral Imaging and Brachytherapy Planning, C.C. Goulet, D.R. Holmes, K.M. Furutani, M.G. Herman, T.M. Wilson, R.A. Robb and B.J. Davis, Brachytherapy, 4, 110, 2005.
8. A Daily Quality Assurance Measurement for Dynamic MLC Treatments, K.M. Furutani, A. Akhtar, R.A. Dahl and T.A. Harms, Med. Phys. 32:2410, 2005.

Selected Books, Chapter Published in Past 5 years

9. None

Resident Training Responsibilities

Clinical direction and mentoring, Physicist On-Call, Plan Checks, and all Brachytherapy

Pertinent Committee Service

2006 Radiation Oncology Clinical Practice Committee
2003 Brachytherapy Working Group
2006 American Brachytherapy Society Physics Committee
2007 GEC-ESTRO Brachytherapy Physics Committee

Michael G. Herman, Ph.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Current: (1998-)

Consultant and Division Chair, Medical Physics
Department of Radiation Oncology, Mayo Clinic
Associate Professor of Radiologic Physics, Mayo Clinic College of Medicine
Full Member Biomedical Engineering Faculty, Mayo Clinic College of Medicine

Prior (1989-1997)

Senior Physicist and Lecturer in Physics, Radiation Oncology, Johns Hopkins Hospital. Acting Chief, Medical Physics, Associate Director Medical Physics
Division of Radiation Oncology, The Johns Hopkins University, School of Medicine
Assistant Professor Oncology, The Johns Hopkins University, School of Medicine
Baltimore, Maryland

Licensure and Board Certification

1994, 2004 American Board of Medical Physics
2001, 2004 American Board of Radiology – Letter of Equivalent Certification

Education and Training

1980 B.S. Engineering Physics, Lehigh University, Bethlehem, Pennsylvania
1982 M.A. Physics, University of Rochester, Rochester, New York
1986 Ph.D. Experimental Nuclear Physics, University of Rochester, Rochester, NY

Teaching Experience

1983-1986 Physics Instructor, University of Rochester,Rochester, New York
1993-1998 Director – Johns Hopkins Graduate Courses ME510.702, ME510.703, ME510.704
1990-1997 Medical Residents, Radiation Oncology Physics-JHU full course, RTT, RTT/Dosimetry School, Radiation Oncology Physics-full course, Radiation Therapy Technology and Dosimetry Johns Hopkins University -Essex Community College Radiation Therapy Technology and Dosimetry School
1998- Director – Mayo Graduate School, Graduate Course BME8150-Radiation Oncology Physics
2000-2006 Co- Director - Mayo Graduate School, Graduate Course BME5160-Basic Radiation Physics
1998- Medical Resident lectures, Radiation Oncology Physics, lectures on Electronic Portal Imaging, Virtual Simulation, Errors and others
2003-2006 Medical Physics Residency Program Director. Mayo School of Graduate Medical Education
1999- Clinical Medical Physics Fellowship Program Director

Fellows, Residents and Graduate Students Preceptored

Allen Williams Ph.D.(Fellow) , Y. Sonya Cong Ph.D.(Fellow), Wilson Fong Ph.D. (Fellow), Kevin O. Khadivi Ph.D. (Fellow), Jon J Kruse Ph.D(Fellow)., Debra Brinkmann, Ph.D (resident), Varun Sehgal Ph.D. (Resident), Joann I Prisciandaro Ph.D.(Fellow), Christopher Hagness, Ph.D. (Resident), Michael Wittmer (Med Student), Christine Frechette, M.D. (Physician resident), Chris Beltran, Ph.D.(Fellow), Luis Fong de los Santos, Ph.D. (Fellow), Chris Goulet, M.D. (Physician resident), Steven Ratliff, Ph.D. (resident), Daniel Mundy (Graduate Student), Thomas Niedermayr, Ph.D. (Fellow)

Clinical Experience

All aspects of medical physics in radiation therapy and oncology in an academic medical center.
1989-1997 – Senior physicist, assistant professor, Johns Hopkins Division of Radiation Oncology, Baltimore, MD
1998- Senior Association Consultant, Consultant, Chair, Medical Physics Division, Mayo Clinic Department of Radiation Oncology, Rochester, MN

Primary Clinical and Service Responsibilities

Stereotactic Radiosurgery, external beam delivery and verification, clinic administration, education

Description of Research Interests

Image guided radiation therapy, dose and geometric verification and complex treatment planning, particle therapy

Selected Publications in Refereed Journals in Past 5 years

1. Beltran C, Herman MG, Davis BJ. Planning target margin calculations for prostate radiotherapy based on intrafraction and interfraction motion using four localization methods. Int J Radiat Oncol Biol Phys 2008 Jan 1; 70(1):289-95.
2. Schallenkamp JM, Herman MG, Kruse JJ, Pisansky TM. Prostate position relative to pelvic bony anatomy based on intraprostatic gold markers and electronic portal imaging. International Journal of Radiation Oncology, Biology, Physics 2005 Nov 1; 63(3):800-11.
3. Wittmer MH, Pisansky TM, Kruse JJ, Herman MG. Patient-specific daily pretreatment setup protocol using electronic portal imaging for radiation therapy. Journal of Applied Clinical Medical Physics 2005; 6(4):1-13. Herman MG. Clinical use of electronic portal imaging. Semin Rad Oncol 2005 Jul; 15(3):157-67.
4. Prisciandaro JI, Frechette CM, Herman MG, Brown PD, Garces YI, Foote RL. A methodology to determine margins by EPID measurements of patient setup variation and motion as applied to immobilization devices. Med Phys 2004 Nov; 31(11):2978-88
5. Su Y, Davis BJ, Herman MG, LaJoie WN, Robb RA. Brachytherapy seed localization from fluoroscopic images using a statistical classifier. Proceedings of the Sixth Annual Conference on Medical Image Computing & Computer Assisted Intervention 2003; 2879:945-6.
6. Herman MG, Mills MD, Gillin MT. Reimbursement versus effort in medical physics practice in radiation oncology. Journal of Applied Clinical Medical Physics 2003 Spring; 4(2):179-87.
7. Prisciandaro JI, Herman MG, Kruse JJ. Utilizing an electronic portal imaging device to monitor light and radiation field congruence. Journal of Applied Clinical Medical Physics 2003 Autumn; 4(4):315-20.
8. Herman MG, Pisansky TM, Kruse JJ, Prisciandaro JI, Davis BJ, King BF. Technical aspects of daily online positioning of the prostate for three-dimensional conformal radiotherapy using an electronic portal imaging device. Int J Radiat Oncol Biol Phys 2003 Nov 15;
9. Kruse JJ, Herman MG, Hagness CR, Davis BJ, Garces YI, Haddock MG,Olivier KH, Stafford SL, Pisansky TM, Electronic and film portal images: a comparison of landmark visibility and review accuracy, Int. J. Rad. Onc. Biol. Phys. 54 (2) 584-591, 2002.

Resident Training Responsibilities

Clinical direction, special procedures, mentoring, MU calculations, shielding, acceptance testing.

Pertinent Committee Service

1993-1997 - Advisory Committee, Johns Hopkins University -Essex Community College Radiation Therapy Technology and Dosimetry School
1998-2005 CAMPEP Residency Education Program Review Committee
2000- Radiation Oncology Executive Committee, Radiation Oncology, Mayo Clinic
2000 – Medical Physics Education Executive Committee, Radiation Oncology, Mayo Clinic
2003- American Board of Radiology Therapy Written committee (chair 2005-
1995- multitude of AAPM/ACMP committees, TG and Councils

Andrew R. Jensen, M.S.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Clinical Medical Physicist, Division of Medical Physics, Department of Radiation Oncology, Mayo Clinic, 2006-present

Licensure and Board Certification

None

Education and Training

University of Wisconsin, Madison, 2004-2006, M.S. Medical Physics
University of Minnesota, Minneapolis, 1999-2004, B.S. Physics, Degree in Biochemistry

Teaching Experience

Mayo School of Health Related Sciences
Physics Instruction
Mayo Program in Radiation Therapy Technology, 2006-present

Fellows, Residents and Graduate Students Preceptored

None

Clinical Experience

Pre-treatment plan review, chart check, HDR and LDR brachytherapy, SBRT, TBI, IORT, linac QA, and outreach coverage for Albert Lea Medical Center.

Primary Clinical and Service Responsibilities

None

Description of Research Interests

None

Selected Publications in Refereed Journals in Past 5 years

None

Selected Books, Chapter Published in Past 5 years

10. None

Resident Training Responsibilities

Clinical instruction in linac quality assurance
Clinical instruction in HDR and LDR brachytherapy

Pertinent Committee Service

None

Robert W. Kline, Ph.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Assistant Professor of Radiation Oncology (1976-86), Medical College of Wisconsin, Milwaukee, WI
Interdisciplinary Biophysics Faculty, (1979-86), Medical College of Wisconsin, Milwaukee, WI
Senior Associate Consultant (1986-89), Consultant in Radiation Oncology (1989-), Mayo Clinic, Rochester, MN
Assistant Professor (1986-97), Associate Professor of Radiologic Physics (1997-), Mayo Medical School, Rochester, MN
Graduate Faculty in Biomedical Imaging (1995-), Mayo Graduate School, Rochester, MN

Licensure and Board Certification

Certificate in Therapeutic Radiological Physics, American Board of Radiology, 1979

Education and Training

1963-1967	St. Mary's College Winona, Minnesota, B.A. (Physics)
1967-1971	Wayne State University, Detroit, Michigan, M.S. (Physics)
1967-1974	Wayne State University, Detroit, Michigan, Ph.D. (Physics)
1975-1976	Rush-Presbyterian-St. Luke's Med. Center, Chicago, Illinois, Fellowship in Clinical Medical Physics

Teaching Experience

Radiation Oncology Residency and Radiation Therapist Programs Medical College of Wisconsin, Mayo School of Allied Health, and Mayo Graduate School - Radiation Therapy Physics, Treatment Planning, Brachytherapy
Co-advisor, Ph.D. candidate, Mayo Graduate School

Fellows, Residents and Graduate Students Preceptored

Clinical Experience

Thirty-one years of broad experience in clinical radiation oncology physics.

Primary Clinical and Service Responsibilities

Principal Gamma Knife physicist. Analysis of new linac beam parameters. Beam modeling.
Interaction with treatment planning computer vendor. Acceptance and implementation of new treatment planning software.

Description of Research Interests

Stereotactic radiosurgery, radiotherapy of Graves' ophthalmopathy, brachytherapy dosimetry

Selected Publications in Refereed Journals in Past 5 years

1. Shaw EG, Scott C, Souhami L, Dinapoli RP, Kline RW, Loeffler JS, Farnan N: Single Dose Radiosurgical Treatment of Recurrent Previously Irradiated Primary Brain Tumors and Brain Metastases: Final Report of RTOG Protocol 90-05: Int J Radiat Oncol Biol Phys, 47(2):291-298, 2000.
2. Pollock BE, Kline RW, Stafford SL, Foote RL, Schomberg PJ: The Rationale and Technique of Staged-Volume Arteriovenous Malformation Radiosurgery. Int J Radiat Oncol Biol Phys 48(3):817-824, 2000.
3. Gorman CA, Garrity JA, Fatourechi V, Bahn RS, Bartley GB, Petersen IA, Stafford SL, Earle JD, Forbes GS, Kline RW, Bergstrahl EJ, Offord KP, Rademacher DM, Stanley NM: A Prospective, Randomized, Double-blind, Placebo-controlled Study of Orbital Radiotherapy for Graves' Ophthalmpathy. Ophthalmology 108(9)1523-34, 2001.

4. Michalski J, Purdy JA, Gaspar L, Souhami L, Ballow M, Bradley J, Chao CK, Crane C, Eisbruch A, Fallowil D, Forster K, Fowler J, Gilllin MT, Graham ML, Harms WB, Huq MS, Kline RW, Mackie TR, Mukherji S, Podgorsak EB, Roach M, Ryu J, Sandler H, Schultz CJ, Schell M, Verhey LJ, Vicini F, Winter KA: Radiation Therapy Oncology Group. Research Plan 2002-2006. Image-Guided Radiation Therapy Committee. Int J Radiat Oncol Biol Phys 51(3 Supp 2):60-5, 2001.
5. Gilllin MT, Galvin J, Brezovich IA, Chu J, Das I, Detorie NA, Fontenla D, Hanson W, Harms WB Sr., Huq MS, Kline R, Orton C, Podgorsak EB, Purdy J, Rosen I, Schell M, Suntharalingam N, Winter KA, De Wyngaert JK: Radiation Therapy Oncology Group. Research Plan 2002-2006. Medical Physics Committee. Int J Radiat Oncol Biol Phys 51(3 Supp 2):96-102, 2001.
6. Foote RL, Pollock BE, Gorman DA, Schomberg PJ, Stafford SL, Link MJ, Kline RW, Strome SE, Kasperbauer JL, Olsen KD: Glomus Jugulare Tumor: Tumor Control and Complications After Stereotactic Radiosurgery. Head&Neck 24(4):332-338, 2002.
7. Gorman CA, Garrity JA, Fatourechi V, Bahn RS, Petersen IA, Stafford SL, Earle JD, Forbes GS, Kline RW, Buettner H, Robertson DM, Bergstralh EJ, Offord KP, Rademacher DM, Stanley NM, Bartley GB. The aftermath of orbital radiotherapy for Graves' ophthalmopathy. Ophthalmology 2002 Nov; 109(11):2100-7.
8. Robertson DM, Buettner H, Gorman CA, Garrity JA, Fatourechi V, Bahn RS, Petersen IA, Stafford SL, Earle JD, Forbes GS, Kline RW, Bergstralh E, Offord KP, Rademacher DM, Stanley NM, Bartley GB. Retinal microvascular abnormalities in patients treated with external radiation for Graves ophthalmopathy. Arch Ophthalmol 2003 May; 121(5):652-7.
9. Brown PD, Kline RW, Petersen IA, Haddock MG. Irradiation of the inguinal lymph nodes in patients of differing body habitus: A comparison of techniques and resulting normal tissue complication probabilities. Med Dosim 2004; 29(3):217-22.
10. Davis BJ, Brinkmann DH, Kruse JJ, Herman MG, LaJoie WN, Schwartz DJ, Pisansky TM, Kline RW. Selective identification of different brachytherapy sources, ferromagnetic seeds, and fiducials in the prostate using an automated seed sorting algorithm. Brachytherapy 2004; 3(2):106-12.
11. Foote RL, Pollock BE, Link MJ, Garces YI, Kline RW. Leksell Gamma Knife coordinate setting slippage: how often, how much? J Neurosurg 2004 Oct; 101(4):590-3.
12. Jensen AW, Petersen IA, Kline RW, Stafford SL, Schomberg PJ, Robertson DM. Radiation complications and tumor control after 125I plaque brachytherapy for ocular melanoma. Int J Radiat Oncol Biol Phys 2005 Sep 1; 63(1):101-8

Selected Books, Chapter Published in Past 5 years

Resident Training Responsibilities

Participate in oral examinations and evaluations, general resource for questions

Pertinent Committee Service

Clinical Practice Committee, Division of Radiation Oncology, Mayo Clinic
Research Committee, Division of Radiation Oncology, Mayo Clinic
Brachytherapy Working Group, Division of Radiation Oncology, Mayo Clinic
Quality Committee, Division of Radiation Oncology, Mayo Clinic
Patterns of Care Study, ACR: 1984-85; 1988-93
Radiotherapy and Physics Committee, Collaborative Ocular Melanoma Study: 1986-96
Radiation Therapy Committee, American Association of Physicists in Medicine: 1986-89
Physics Committee, Radiation Therapy Oncology Group: 1992-
Task Force on Radiosurgery Quality Assurance, Radiation Therapy Oncology Group: 1992-93
Task Force on Stereotactic Radiosurgery, ASTRO: 1992-93
I-125 Dose Implementation Ad-Hoc Committee, AAPM: 1996-98
Graduate Education Program Review Committee, Commission on Accreditation of Medical Physics Education Programs: 1995-2001

Jon J. Kruse, Ph.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Instructor of Radiologic Physics, College of Medicine, Mayo Clinic, 2002-present
Consultant, Department of Radiation Oncology, Mayo Clinic, 2002-present

Licensure and Board Certification

American Board of Radiology, Therapeutic Radiologic Physics, 2005

Education and Training

Research Fellowship in Medical Physics; Mayo Clinic Division of Radiation Oncology, 1999-2002
Ph.D. in nuclear physics; Michigan State University, 1992-1999
B.A. in physics, Monmouth College, Monmouth, IL, 1988-1992

Teaching Experience

Graduate teaching assistant; Michigan State University, 1992-1995, taught lab and recitation sessions

Fellows, Residents and Graduate Students Preceptored

Kmety-Stevenson, Carmen (Resident, Mayo Clinic) 2004-2006

Clinical Experience

3-year research fellowship with 50% clinical component
Current appointment involves 60% clinical activity

Primary Clinical and Service Responsibilities

Periodic accelerator calibration and quality assurance
Clinical application of electronic portal imaging devices
High dose rate brachytherapy – QA, dosimetry, safety responsibilities
Intensity modulated radiation therapy – commissioned system, dosimetry, plan QA

Description of Research Interests

Intensity Modulation Radiation Therapy, Image Guided Radiation Therapy, Charged Particle/Heavy Ion Radiation Therapy

Selected Publications in Refereed Journals in Past 5 years

1. Prisciandaro JI, Herman MG, Kruse JJ. Utilizing an electronic portal imaging device to monitor light and radiation field congruence. Journal of Applied Clinical Medical Physics 2003 Autumn; 4(4):315-20.
2. Herman MG, Pisansky TM, Kruse JJ, Prisciandaro JI, Davis BJ, King BF. Technical aspects of daily online positioning of the prostate for three-dimensional conformal radiotherapy using an electronic portal imaging device. Int J Radiat Oncol Biol Phys 2003 Nov 15; 57(4):1131-40.
3. Davis BJ, Brinkmann DH, Kruse JJ, Herman MG, LaJoie WN, Schwartz DJ, Pisansky TM, Kline RW. Selective identification of different brachytherapy sources, ferromagnetic seeds, and fiducials in the prostate using an automated seed sorting algorithm. Brachytherapy 2004; 3(2):106-12.
4. Wittmer MH, Pisansky TM, Kruse JJ, Herman MG. Patient-specific daily pretreatment setup protocol using electronic portal imaging for radiation therapy. Journal of Applied Clinical Medical Physics 2005; 6(4):1-13.
5. Schallenkamp JM, Herman MG, Kruse JJ, Pisansky TM. Prostate position relative to pelvic bony anatomy based on intraprostatic gold markers and electronic portal imaging. International Journal of Radiation Oncology, Biology, Physics 2005 Nov 1; 63(3):800-11.

Selected Books, Chapter Published in Past 5 years

Resident Training Responsibilities

Mentoring in clinical duties, didactic lectures

Pertinent Committee Service

Radiation Oncology Medical Physics Residency Education Executive Committee
Radiation Oncology Medical Physics Residency Admissions Committee
Division of Medical Physics Residency Program Executive Committee

Kevin P. McCollough, M.Sc.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Medical Physicist ,Division of Radiation Oncology, Mayo Clinic, Rochester, Minnesota
February 1991 - present

Instructor of Radiologic Physics **(**July 1995 – June 2000)
Assistant Professor of Radiologic Physics **(**June 2000 – Present)
Mayo Medical School, Mayo Clinic, Rochester, Minnesota

Licensure and Board Certification

The American Board of Radiology**,** Therapeutic Radiological Physics (1994)
State of Florida, License No. TRP 99

Education and Training

Bachelor of Science, Physics (1985), Hope College, Holland, Michigan
Master of Science, Medical Physics (1989) , University of Wisconsin, Madison, Wisconsin

Teaching Experience

Mayo Graduate School -Clinical Quality Assurance Training of Ph.D. Candidates (in Biomedical Imaging

Mayo Graduate School of Medicine - Clinical Radiation Therapy Physics Training of Medical Physics Residents

Mayo Graduate School of Medicine - Clinical Radiation Therapy Physics Training of Medical Physics Post-Doctorates

Mayo School of Health-Related Sciences- Teach Radiation Oncology Physics

Medical Physics Intern Program – Training of summer interns in radiation physics

Clinical Experience

Close to 20 years as a clinical physicist.

Primary Clinical and Service Responsibilities

Immobilization
Multi-Leaf Collimation
Virtual Simulation
High Dose Rate Brachytherapy
Stereotactic Body Radiotherapy (SBRT)
Regional Practice Coordination

Description of Research Interests

Small Field Conformal (SFC) treatments with BrainLab

Selected Publications in Refereed Journals in Past 5 years

1. Bourland JD, McCollough KP, ‘‘Static field conformal stereotactic radiosurgery: Physical techniques,’’ *International Journal of Radiation Oncology, Biology and Physics*, 28(2):471-479 (1994).
2. McCullough EC, McCollough KP, Simon SP, ‘‘Improving agreement between radiation-delineated field edges on simulation and portal films: The edge tolerance test tool,’’ *Medical Physics*, 20:375-376 (1993).

Selected Books, Chapter Published in Past 5 years

Resident Training Responsibilities

One on one training for Physicist of the Day duties (machine call/plan checks) , Virtual simulation and Machine/simulator QA and calibrations.

Pertinent Committee Service

Albert Lea Facility Design Committee
Lacrosse Facility Design Committee
Eau Claire Facility Design Committee
MLC Task Group
Immobilization Task Group
3D Treatment Planning Task Group
HDR Task Group
CT Simulation Task Group
New Technology Selection and Implementation Task Group

Luke B. McLemore, M.S.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Radiation Oncology Clinical Medical Physicist, 7/31/2000
Instructor in Oncology, Mayo Clinic College of Medicine

Licensure and Board Certification

Board Certification – The American Board of Radiology: Certification in Therapeutic Radiologic Physics 2003

Education and Training

B.S. in Physics
King College
Bristol, TN

B.A. in Mathematics
King College
Bristol, TN

Master of Science in Medical Physics
The University of Texas Health Science Center at Houston, Graduate School of Biomedical Sciences
Houston, TX

Teaching Experience

Radiation Oncology Residents
Didactic Physics Instruction: Prostate Brachytherapy, Mayo Medical School, 2002 - 2006
Mayo School of Health Related Sciences: Radiation Therapy Program
Monitor Unit Calculations, 2002
Quality Assurance, 2003
X-Ray Production and Treatment Units, 2003
Ultra-Sound, 2004 – 2007
Electromagnetic Radiation & Atoms/Nuclei (Structure of Matter), 2006
Transmission/Interactions of Photons, 2006
Brachytherapy, 2007-2008
Mayo School of Graduate Medical Education
Clinical Radiation Therapy Physics Training for Medical Physics Residents and Post-Doctorates (2002 – Present)

Clinical Experience

Department of Radiation Oncology, Mayo Clinic/Foundation, 31/July/2000 – Present

Primary Clinical and Service Responsibilities

Responsible for ongoing development, shared oversight and participation in the Brachytherapy program within the Division of Radiation Oncology, Mayo Clinic / Foundation.

Clinical physics duties within the Division of Radiation Oncology, Mayo Clinic / Foundation, including:
- Patient treatment plan reviews prior to treatment
- Weekly patient chart reviews
- Total-Body photon Irradiation (calculations and in-vivo diode measurements for treatment verification)
- Intra-Operative Electron Radiation Therapy
- Brachytherapy Treatment planning and Physics oversight
- Special radiation therapy patient measurements, setup, and calculations (total scalp with electrons and HDR Brachytherapy, blocked electron fields, TBI calculations, and fetal dose estimation in addition to dose reduction with shielding)
- Outreach physics and dosimetry support for Radiation Oncology at the satellite facility in Albert Lea, MN.

All aspects of quality assurance for a Varian Clinac 21EX linear accelerator within the Division of Radiation Oncology, Mayo Clinic / Foundation
All aspects of quality assurance for a Varian VariSource HDR afterloader and a Nucletron mHDR afterloader
Participation in acceptance testing and commissioning Varian 21EX linear accelerators
Clinical use and calibration of EPID
Commissioning Treatment Planning software (VariSeed, PLATO, BrachyVision) for Brachytherapy
AMP for Gamma Knife
Physics consults for image guided radiation therapy procedures (i.e., 4DCT, Prostate Seed Markers)

Description of Research Interests

Radiation Dosimetry; Brachytherapy; Treatment Planning and Optimization; Image Guided Radiation Therapy, Respiratory Gated Radiation Therapy

Selected Publications in Refereed Journals in Past 5 years

None

Selected Books, Chapter Published in Past 5 years

None

Resident Training Responsibilities

Brachytherapy
Linac Quality Assurance
Machine troubleshooting
Treatment plan evaluation
General Resource

Pertinent Committee Service

None

Janelle M. Miller, CMD

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

Certified Medical Dosimetrist, Department of Oncology, Division of Radiation Oncology, Mayo Clinic
Supervisor of Dosimetry

Licensure and Board Certification

American Registry of Radiologic Technologists (Radiology, Therapy), 1994
Certified Medical Dosimetry, 2000

Education and Training

Mankato State University 1988-1991
Mayo School of Health Sciences/Rochester Community College, AS Radiography 1991-1993
Mayo School of Health Sciences, Certified Radiation Therapist, 1994
Medical Dosimetrist in Training, Mayo Clinic, 1997-2000
Certified Medical Dosimetrist 2000

Teaching Experience

Clinical Experience

3-D/2-D/IMRT Treatment planning
Intra-operative Radiation Therapy
Weekly Chart Checks
CT/MRI/PET Scanning for planning purposes
Radiation Therapy Treatment Delivery

Primary Clinical and Service Responsibilities

Supervisor of Dosimetry
External Beam Treatment Planning

Description of Research Interests

None

Selected Publications in Refereed Journals in Past 5 years

None

Selected Books, Chapter Published in Past 5 years

None

Resident Training Responsibilities

Treatment Planning in Dosimetry

Pertinent Committee Service

Data Flow Task Group, Division of Radiation Oncology
Regional Practice Committee, Division of Radiation Oncology
Regional Dataflow Committee, Division of Radiation Oncology
OBI Committee, Division of Radiation Oncology
Brainlab SBRT Committee, Division of Radiation Oncology
IS Committee, Division of Radiation Oncology

Jann N. Sarkaria, M.D.

Biographical Sketch for Radiation Oncology Clinical Medical Physics Residency Program

Professional and Faculty Appointments

1991-1995	Residency in radiation oncology, University of Wisconsin, Madison; Timothy J. Kinsella, M.D., Chairman of Human Oncology
1992-1993	Radiation biology research in the laboratory of R. Timothy Mulcahy, Ph.D., University of Wisconsin, Madison
1995-1996	Radiobiology research fellowship in the laboratory of G. Gordon Steel, Ph.D., D.Sc., Institute of Cancer Research, Sutton, UK
1997-1998	Signal transduction research in the laboratory of Robert T. Abraham, Ph.D., Mayo Clinic, Rochester, MN
1997-2000	Senior Associate Consultant, Department of Oncology, Mayo Clinic, Rochester, MN
1997-1999	Instructor, Mayo Medical School, Mayo Clinic, Rochester, MN
1999-2008	Assistant Professor, Mayo Medical School, Mayo Clinic, Rochester, MN
2008-present	Associate Professor, Mayo Medical School, Mayo Clinic, Rochester, MN
2000-present	Consultant, Department of Oncology, Mayo Clinic, Rochester, MN

Licensure and Board Certification

Minnesota – 39688	American Board of Radiology – Radiation Oncology
Wisconsin – 32368	National Board of Medical Examiners – Diplomate

Education and Training

Institution and Location	Degree	Year(s)	Field of Study
University of California, Irvine, CA	B.S., B.S.	1983-1986	Biology and Chemistry
University of California, Los Angeles, CA	M.D.	1986-1990	Medicine
University of Hawaii, Honolulu, HI	Internship	1990-1991	Medicine and Surgery
University of Wisconsin, Madison, WI	Residency	1991-1995	Radiation Oncology
American Board of Radiology	Certification	1995	Radiation Oncology
University of London, Sutton, UK	Fellowship	1995-1996	Radiobiology

Teaching Experience

1997-1999	Instructor, Mayo Medical School, Mayo Clinic, Rochester, MN
1999-2008	Assistant Professor, Mayo Medical School, Mayo Clinic, Rochester, MN
2008-present	Associate Professor, Mayo Medical School, Mayo Clinic, Rochester, MN

Fellows, Residents and Graduate Students Preceptored

Brian Kastner, MD
Katie Shide, MD
Michelle Clarke, MD

Clinical Experience

1991-1995	Residency in radiation oncology, University of Wisconsin, Madison; Timothy J. Kinsella, M.D., Chairman of Human Oncology
1997-2000	Senior Associate Consultant, Department of Oncology, Mayo Clinic, Rochester, MN
2000-present	Consultant, Department of Oncology, Mayo Clinic, Rochester, MN

Primary Clinical and Service Responsibilities

Consultant for gastro-intestinal and thoracic radiation oncology.

Description of Research Interests

Our research lab is focused on developing novel therapeutic strategies for glioblastoma multiforme. The main projects that are ongoing include: 1) evaluation of mechanisms of resistance to temozolomide, 2) evaluation of the PARP inhibitor ABT-888 in combination with temozolomide, 3) evaluation of various tyrosine kinase inhibitors in alone or in combination with radiation and temozolomide, 4) evaluation of PET imaging as a predictor of response to novel therapeutic agents.

Selected Publications in Refereed Journals in Past 5 years

1. Rao RD, Buckner JC, Sarkaria JN. Mammalian target of rapamycin (mTOR) inhibitors as anti-cancer agents. Current Cancer Drug Targets 2004 Dec; 4(8):621-35.
2. Giannini C, Sarkaria JN, Saito A, Uhm JH, Galanis E, Carlson BL, Schroeder MA, James CD. Patient tumor EGFR and PDGFRA gene amplifications retained in an invasive intracranial xenograft model of glioblastoma multiforme. Neuro-oncol 2005 Apr; 7(2):164-76.
3. Rao RD, Mladek AC, Lamont JD, Goble JM, Erlichman C, James CD, Sarkaria JN. Disruption of parallel and converging signaling pathways contributes to the synergistic antitumor effects of simultaneous mTOR and EGFR inhibition in GBM cells. Neoplasia 2005 Oct; 7(10):921-9.
4. Sarkaria JN, Carlson BL, Schroeder MA, Grogan P, Brown PD, Giannini C, Ballman KV, Kitange GJ, Guha A, Pandita A, James CD. Use of an orthotopic xenograft model for assessing the effect of epidermal growth factor receptor amplification on glioblastoma radiation response. Clin Cancer Res 2006 Apr 1; 12(7 Part 1):2264-71.
5. Yu CR, Friday BB, Lai JP, Yang L, Sarkaria J, Kay NE, Carter CA, Roberts LR, Kaufmann SH, Adjei AA. Cytotoxic synergy between the multikinase inhibitor sorafenib and the proteasome inhibitor bortezomib in vitro: induction of apoptosis through Akt and c-Jun NH2-terminal kinase pathways. Molecular Cancer Therapeutics 2006 Sep; 5(9):2378-87.
6. Sarkaria JN, Yang L, Grogan PT, Kitange GJ, Carlson BL, Schroeder MA, Galanis E, Giannini C, Wu W, Dinca EB, James CD. Identification of molecular characteristics correlated with glioblastoma sensitivity to EGFR kinase inhibition through use of an intracranial xenograft test panel. Mol Cancer Ther 2007 Mar; 6(3):1167-74.
7. Sarkaria JN, Schwingler P, Schild SE, Grogan PT, Mladek AC, Mandrekar SJ, Tan AD, Kobayashi T, Marks RS, Kita H, Miller RC, Limper AH, Leof EB. Phase I trial of sirolimus combined with radiation and cisplatin in non-small cell lung cancer. J Thorac Oncol 2007 Aug; 2(8):751-7.
8. Dinca EB, Sarkari JN, Schroeder MA, Carlson BL, Voicu R, Gupta N, Berger MS, James CD. Bioluminescence monitoring of intracranial glioblastoma xenograft: response to primary and salvage temozolomide therapy. J Neurosurg 2007 Sep; 107(3):610-6.

Selected Books, Chapter Published in Past 5 years

1. Krishnan S, Rao RD, James CD, Sarkaria JN. Combination of epidermal growth factor receptor targeted therapy with radiation therapy for malignant gliomas. Front Biosci 2003 Jan 01; 8:e1-13.
2. Sarkaria JN. Identifying inhibitors of ATM and ATR kinase activities. In: Buolamwini JK, Adjei AA, editors. Novel anticancer drug protocols. Volume 85. Totowa: Humana Press; 2003. (Methods in molecular medicine.). p. 49-56.

3. Sarkaria JN. Combinations of cytotoxic drugs, ionizing radiation, and mammalian target of rapamycin (mTOR) inhibitors. In: Brown JM, Mehta MP, Nieder C, editors. Multimodal concepts for integration of cytotoxic drugs. Berlin: Springer-Verlag Berlin; 2006. (Medical Radiology: Diagnostic Imaging and Radiation Oncology.). p. 127-37.

Resident Training Responsibilities

Director of Radiation Biology Course

Pertinent Committee Service

Chairman of the Radiation Oncology Research Committee
Member – Radiation Oncology Executive Committee

Attachment 24. Clinical and Dosimetry Resources

I. Mayo Clinic Rochester

A. External Beam Treatment Machines

- 6 Varian Clinac 2100 EX Linear Accelerators
  - All with 120-leaf MLC – 120, Impac R&V, EPID
  - 3 with OBI imaging
  - 3 with RPM™ gating system
  - 1 with ExacTrac image guidance and robotic couch
- 1 Varian Clinac 2100 CD (IORT – electrons only)
- 1 Gamma Knife Perfexion

B. Simulators

- 2 GE 16-slice large-bore CT Simulators with 4D imaging capability
- 1 Varian Acuity fluoroscopic simulator

C. Treatment Planning Systems

- Varian Eclipse with 26 planning workstations
- Leksell Gamma Plan (with APS planning)
- Nucletron Plato HDR Treatment
- Varian Variseed US guided PSI system

D. Brachytherapy Resources

- 1 Nucletron HDR remote afterloading machine
- 1 VariSource HDR remote afterloading machine
- 1 GE 4-slice CT simulator dedicated to brachytherapy
- Ultrasound guided prostate seed implantation system
- COMS eye plaque system
- Traditional intracavitary (Cs-137) and interstitial (Ir-192) brachy sources

E. Dosimetry Resources

- NIST calibrated ion chamber/electrometer
- Misc ion chambers/electrometers
- Marcus parallel plate chamber
- Scanditronics diode system (5 channel)
- 2 Wellhofer WP-700 scanning water phantoms

- Profile devices
- Keithley Tracker/Argus QA modules
- Survey meters
- Solid water phantoms
- PTW extrapolation chamber
- Digital barometer
- NIST Traceable thermometer
- Multiple aneroid barometers/thermometers

II. Regional Practice

There are currently four regional practice sites in the Mayo Health System in southern Minnesota (Albert Lea and Mankato) and Wisconsin (Eau Claire and La Crosse). All regional practice sites have CT-simulation capability, and dual-energy linear accelerators with MLC, EPID, and electron capability. Treatment planning and R&V are integrated with the Rochester practice using a wide-area network (T1 lines), with servers located in Rochester. Four physicists staff the regional clinics (2 in Eau Claire, 1 in La Crosse, 1 in Mankato) with Rochester staff providing coverage in Albert Lea. Rochester staff are also involved in traveling to the regional sites to help with standardization of procedures across the practice and also to provide vacation coverage. In addition, regional physicists will travel to Rochester for some meetings, training, and continuing education. The regional practices provide an excellent opportunity for residents to learn about a smaller practice with the backup of physics resources in Rochester.