Medical Scientist Training Program Guidebook 2015

“How To Survive”

Medical University of South Carolina
College of Graduate Studies & College of Medicine
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MEDICAL SCIENTIST TRAINING PROGRAM
Steering Committee
2015-2016

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Distinguished University Professor

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Associate Professor of Regenerative Medicine
and Cell Biology

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Medicine

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Professor of Microbiology & Immunology

Dr. Graham Warren
Associate Professor of Radiation Oncology

Dr. Michael Yost
Associate Professor of Surgery

Dan Neitzke
MSTP Student Representative
Steering Committee

The Steering Committee is composed of the Program Director, Associate Program Directors, faculty members who represent the major basic and clinical departments and programs, a student representative, and the Senior Associate Dean for Education for the College of Medicine. The committee has the responsibility for the oversight and direction of the program. In addition to the Admissions Committee, the members of the Steering Committee participate in the interview process for potential students. The committee meets four times a year.

Student Representative to the Steering Committee

From the student's perspective, the MSTP Steering Committee is the group of faculty that make the major decisions concerning the program. The Steering Committee has a strong commitment to instituting plans that will help make this the best program it can be. Since many of these plans and decisions impact greatly on the students in the program, one Student Representative sits on the committee as a full voting member. The Student Representative is elected by the students in the program to serve a one-year term on the committee. While on the committee, the Student Representative is responsible for carrying the students’ ideas, suggestions, and concerns back to the committee and generally voicing the opinion of the MSTP students to the committee. The Student Representative also participates in the admissions process by interviewing applicants as part of the regular interview process. The Student Representative is encouraged, as she or he listens to the other students in the program, to propose and help implement new ideas that will help to improve the program.

Interview Day

The interview process for the Medical Scientist Training Program (MSTP) consists of three or four interviews with admissions committee members and 1 member of the College of Medicine Admissions Committee (each lasting about 30 minutes), a tour of the campus followed by 3-4 interviews with faculty discussing their research interests. Generally, the morning interviews are with members of the Medical Scientist Training Program (MSTP) Steering Committee or Admissions Committee. After an informal lunch with several current students, the afternoon provides the applicant with an opportunity to explore research training opportunities with various faculty, departments or programs. That evening, an informal dinner with several students allows the applicant an opportunity to gain additional MSTP students’ perspectives of the program and Charleston. The following morning there is a professional guided tour of Charleston followed by a brunch with several current students. After which the applicant is free to either explore more of Charleston or start to return home. Charleston was voted the number one world-wide tourist attraction in 2013 by Conde’ Nast Traveler magazine and in 2014 the number one tourist attraction in the US. Thus, it is worthwhile taking a little extra time.

Housing

The Office of Off-Campus Housing (SW213 Harper Student Center, (843-792-0394) keeps a list of houses and apartments that are for rent by individuals and complexes. They also keep a list of new and returning students who are looking for roommates to share the cost of living.
Funding

Students are provided a stipend, $24,000 per year, paid health insurance and tuition, during their tenure in the program. The College of Graduate Studies provides funding for the stipend, health insurance, tuition and fees during the first 2 years of medical school as well as the first 12 months of the PhD years. After that period of time, the mentor is required to fund the stipend, health insurance and tuition until the student returns to medical school. If the student chooses to provide their own health insurance, the premium costs will be reimbursed up to the amount charged our students by Pearce and Pearce Insurance Company.

During the graduate years, the students along with their mentors, are strongly encouraged to apply for individual extramural scholarships or fellowships. The success rate for our students is at least twice the national average. Many of our students have been very successful in obtaining their own fellowships. The Dean of the College of Graduate Studies has instituted an incentive plan for those students receiving their own extramural fellowship. Students receiving an extramural training grant that pays 60% or more of their tuition receive a $1,500/year incentive for the years that they have the fellowship. Students obtaining a scholarship or fellowship that does not pay tuition costs or less than 60% of full tuition may still receive a prorated incentive to be negotiated with their mentor. Students may receive a position on the NIGMS Training Grant that pays the stipend plus tuition, health insurance and fees. Appointment to this grant does not come with the $1500 incentive. See the list of opportunities for funding that do not exclude MD/PhD students. (Appendix A)

Tuition Bills, Dean Scholarships and Health Insurance

Students with financial support, i.e. stipend/payroll funded doctoral and dual degree doctoral students, need to submit a completed Authorization of Financial Support form each semester, to Dodie Weise, in the College of Graduate Studies Dean's Office. It is very important that we know if you are supported via stipend or payroll, what the source of that support is, and what the tuition funding availability is on any applicable grant. Whether you are paid via stipend or payroll affects how the portion of the tuition that is paid is handled.

It is the responsibility of the student to provide a copy of their tuition bill to the area that is also funding their stipend support each semester. The financial offices need to see the bills so that they know to pay for health insurance that may be included on the bill. This is also required for any stipend paid student and for any training grant funded student.

Financially supported students using health insurance vendors other than AIG via MUSC Student Health, can file for reimbursement of premiums up to the AIG rate. Proof of payment and dates of coverage should be submitted to the office that is funding your stipend/payroll support.

Tuition bills will be posted to WebAdvisor via Student Accounting. Any delays in registering for classes, submitting the Authorization of Financial Support form, or submitting an incomplete Authorization of Financial Support form can result in a delay of Dean’s Scholarships being posted. Students receiving other financial aid are asked to notify Ms. Connolly, College of Graduate Studies Dean’s Office, that they are waiting for aid to be released. This will assist Ms. Connolly in scheduling the posting of applicable Dean’s Scholarships and help to minimize any delays in the release of the funds to you. It is not a requirement that you provide any additional financial aid information to Ms. Connolly, but it can help with the timing of the process. Ms. Connolly can be reached at 101 Bioengineering Building or via email at connolla@musc.edu.
Income Tax Information for Students with Stipend Support

Students receiving stipend support will not have income taxes withheld from their stipend payments. The exception to this is some international students depending on their home country’s tax treaty with the United States. International students may be contacted to meet with Andrew Rider concerning tax withholding. Stipend students that want to have taxes withheld, but are not required to, should also contact Andrew Rider.

Stipend support is considered taxable income. Any stipend funds used for living expenses is taxable. This would apply to all or the majority of your stipend support as your tuition is funded by a combination of a Dean’s Scholarship and payments by the College or a MUSC Department.

You will receive a 1098-T form from Student Accounting at the end of January. This 1098-T is how your stipend and any scholarships are reported to the IRS. The 1098-T reports tuition billed as well as any stipend support received, tuition scholarships/payments/waivers or any other non-tuition type scholarships. The block that reports your stipend also includes your scholarships. Tuition scholarships/payments/waivers made in your behalf are currently not considered taxable income.

It is suggested that you consult a professional tax preparer concerning the taxability of your stipend. You can refer to IRS Publication 970 for information relating to scholarships and stipend support. Page 8 of the 2014 Publication 970 is where you can find the statement concerning tuition scholarships not being taxable. Students are finding it difficult to use a program such as TurboTax when entering 1098-T data that includes tuition scholarships.

You are also advised to either save some funds back to cover a tax liability due to no tax withholding for stipends or to make quarterly payments to the IRS. You can find a form to submit when mailing quarterly payments at the irs.gov website.

Graduate students receiving their support via payroll will have income taxes deducted from their checks. These students are considered “graduate assistants” for reporting purposes. Currently State and Federal income taxes will be withheld, but not FICA and Medicare taxes. The FICA and Medicare withholding exemptions are subject to change based on federal tax code changes. Payroll supported students will receive a W-2 from Payroll and a 1098-T from Student Accounting.

1098-Ts and W-2s are made available electronically by the end of January for the previous year. Instructions will be provided to you via your MUSC email account.

Stipend or salary support is usually determined by the source of funds paying your stipend or salary. Some grants require payroll support and many training grants require stipend support. Most non-grant funded support is provided via stipend and not payroll.

If you are receiving stipend support from the Dean’s Office, you may find that when your support transfers to your research mentor that you will be moved to payroll support. You may also find that once on payroll, you are again moved to stipend if you receive your own individual training grant or a research grant lapses.

The above information is not considered as official income tax information as tax codes can change during the year.

Please contact Karla Locklear, Business Manager, College of Graduate Studies, for any questions concerning financial matters.

Student Organizations

Graduate Student Association
The Graduate Student Association (GSA) Senate is composed of a student representative from each of the graduate programs. The executive council is composed of the
President, Vice-President, Secretary and co-Treasurers. This organization allows graduate students to participate in the design of their formal education and provides a forum for students to express opinions about the graduate school to the administration. This group meets with the Dean of the College of Graduate Studies to discuss matters pertaining to graduate education and student well-being. These meetings keep the students abreast of the growing University and its changing policies. Representatives to standing committees of the College are appointed from the Graduate Student Association Executive Committee. Elections to the Graduate Student Association are held each year in the spring and all interested students are encouraged to become candidates.

The goal of the Graduate Student Association (GSA) is to promote graduate student involvement in university affairs by initiating dialogue between students and faculty while encouraging student interest and involvement. All students of the College of Graduate Studies are members of the GSA. The GSA Senate acts as the representative council for the graduate students to the College of Graduate Studies. Representatives from each of the basic science disciplines, as well as from the Medical Scientist Training Program (MSTP) and the Multicultural Graduate Student Association (MGSA), hold seats on the GSA Senate. The senate also acts as the Honor Council for College of Graduate Studies if an honor violation occurs. Faculty advisors to the senate include, but are not limited to, the Dean and Associate Deans of the College of Graduate Studies. Representatives to standing University committees are also elected from the senate members. These committees include the Graduate Council, MUSC Student Government Association, the SGA President’s Council, and the Alcohol Awareness Committee.

**Graduate Student Association Events**

Please join your fellow students at our many events throughout the year! These include: New Student Social, Happy Hours for relaxation and socialization, Winter Cocktail Party, Graduate Student Spring Picnic, volunteer activities (Hope Lodge, Habitat for Humanity, and many others). We hope to see you at these events. It provides a fun, relaxing way to make new friends and hang out with old ones, as well as getting to know your professors in an informal setting. We also encourage you to become involved in our scientific outreach program, G.R.O.W.S. (Graduate Students Reaching Out With Science) which allows graduate students to share their knowledge and passion of science with middle school students. We have developed various modules such as how the brain works, how the heart works and basics of genetics. We work with schools all over the greater Charleston area. This is a great opportunity to share your knowledge and serve the community.

**Multicultural Graduate Student Association**

The Multi-Cultural Graduate Student Association (MGSA) welcomes you to the College of Graduate Studies (CGS) and to the Medical University of South Carolina (MUSC). MGSA is a student organization open to ALL interested students officially enrolled in our college. Some of the goals of the MGSA are:

1) To enhance the well-being of all graduate students enrolled at the Medical University with particular concern to specific needs of students of color;
2) To encourage communication between students of color, university administration and other student organizations in order to facilitate the exchange of ideas and information that will enhance the efficiency of achieving solutions to common and/or particular problems;
3) To encourage and aid in the recruitment of minority students to the CGS and MUSC;
4) To plan activities that will be socially, culturally and educationally enriching to the membership and the university community.
As you adjust to your new academic environment and the rigors of graduate school, we urge you to get involved with MGSA. It is our goal that MGSA serves as a network for students and students of color in particular, fostering relationships between prospective and current minority graduate students, post-docs and minority faculty.

**MSTP Women’s Advocacy Group**

The Women’s Advocacy Group was established in the Fall of 2014. They have monthly evening meetings with dinner. There are guest speakers that are role models. In addition, they have discussions about professional development and building a career in science.

**First and Second Summers**

First and second year students are automatically registered for fall and spring semesters by the College of Medicine. However, they must register for summer semester before and after Med-1 and Med-2 years. Students are expected to arrive no later than July 1 and be ready to start a laboratory rotation. Exceptions will be considered by the program director.

Before a MSTP student can choose a dissertation advisor, they have to perform at least two different laboratory rotations. MSTP students do their first laboratory rotation during the summer before the first year of medical school. This is a great opportunity to get to know some of the professors and fellow MSTP students and to get a feel for the research that is being conducted at the University. Starting out at a new school can be intimidating. It will be hard to find that first laboratory, but you should be aggressive and talk to as many professors and fellow students as possible. If you interviewed with any faculty members whose research interested you, talk to them to see if they have room in their laboratory for a summer student. You can also use departmental brochures, the College of Graduate Studies Faculty Research Interest website at [https://mainweb-v.musc.edu/grad/inquiry/fac_list.html](https://mainweb-v.musc.edu/grad/inquiry/fac_list.html), department heads, the program director or associate program director as good sources for names of faculty members who conduct research in a field that interests you. Look for laboratories that have grants and recent publications. The program director must approve your choice of a summer mentor. When you talk to the professors, ask them whether they will be able to start you on a project of your own; it is better to do work that is publishable than to simply be a laboratory technician for a summer. Even if you can't publish the work you did the first summer, try to participate in Perry V. Halushka Student Research Day in the fall (a campus wide research day different from MSTP Research Day in the spring). This is great practice for future presentations and meetings. Attend the monthly MSTP seminars and talk to upperclassmen about laboratories they have worked in to help you decide where you would like to do your second rotation and dissertation laboratory. You may want to make as many friends among the upperclassmen as possible; they are a good source of free advice and textbooks for medical school. Most importantly, try to have fun and learn as much as possible.

**Individual Development Plan (IDP)**

In the last several years there has been a move nationally for all trainees in the biomedical sciences to fill out their own IDP. Indeed, the NIH now requires it of all trainees. The data show that those individuals that fill out their own IDP, progress through their training in a more efficient and successful manner compared to those that do not (see Appendix B). The IDP for our MSTP students has been modified by their peers to more closely fit the needs of MSTP students. The IDP is reviewed by the program director and other appropriate members of the Steering Committee during the years that the student is in medical school and by the student’s mentor during graduate school. The IDP should be reviewed at least annually and most importantly in the year prior to transitioning from medical to graduate school and graduate
school to medical school and then towards the end of the 3rd year of medical school. An example of the IDP form can be found at Appendix B. The fillable form of the IDP can be found on our website at http://academicdepartments.musc.edu/grad/programs/md_phd_program/Individual Development Plan

**USMLE Requirements**

**Part One of the USMLE**

It has been the experience of MSTP students studying for part one of the USMLE that one month is a sufficient amount of time to prepare for the examination. Taking more than that amount of time results in a diminishing return for the effort expended. Therefore, the steering committee recommends that students schedule their examination date **no later** than one month after finishing the second year of medical school. By so doing it maximizes the time that you have to start on your dissertation project. If someone needs longer than one month they should consult with either the program director or associate program director to get approval for an extension of this period.

**Special Notice for MD/PhD Candidates from the USMLE**


The common pathway for MD/PhD students involves completing the first two years of medical school and then moving to graduate school studies and research for a three- or four-year period. Following completion of PhD course work and all or most of their research projects, these students return to complete their two clinical years, thus completing the medical degree in seven to eight years after first matriculating.

The USMLE program recognizes that the recommended seven-year time limit may pose problems for medical licensure for some students pursuing a combined degree (i.e., MD/PhD). It is for this reason that the USMLE program recommends to licensing jurisdictions that they be willing to consider exceptions to the seven-year limit for MD/PhD students who meet certain narrow requirements. The recommended requirements are as follows:

1. The candidate is working toward both degrees in an institution or program accredited by the LCME and regional university accrediting body and is a student in good standing, enrolled in the institution or program.
2. The PhD studies should be in a field of biological sciences tested in the Step 1 content. These fields include but are not necessarily limited to anatomy, biochemistry, physiology, microbiology, pharmacology, pathology, genetics, neuroscience, and molecular biology. Fields explicitly not included are business, economics, ethics, history, and other fields not directly related to biological science.
3. Candidates seeking an exception to the seven-year rule should be required to present a verifiable and rational explanation for the fact that he or she was unable to meet the seven-year limit. Although these explanations will vary considerably, each licensing jurisdiction will need to decide on its own which explanation justifies an exception.

Students who pursue both degrees should understand that while many states’ regulations provide specific exceptions to the seven-year rule for dual degree candidates, others do not. Students pursuing a dual degree are advised to check the state-specific requirements for licensure listed by the FSMB.
Tutoring in the Center for Academic Excellence

Students wishing to tutor in the Center for Academic Excellence must receive prior approval from their mentor and the program director.

Working outside of the laboratory

It is the rule of the College of Graduate Studies that students on a full stipend are not allowed to work outside of the laboratory without the consent of their mentor or program coordinator. This applies to all extracurricular activities including tutoring at the Center for Academic Excellence. For students in the first two years or last two years of medical school, permission to engage in tutoring or other extracurricular work must be obtained from either the program director or associate program director.

Choosing Laboratory Rotations and a Mentor/Laboratory

Laboratory rotations are normally done the summer before the first year of medical school and the summer in between the first and second year. Students are required to rotate through two DIFFERENT laboratories before deciding on a laboratory for your dissertation. When deciding on a laboratory for your dissertation, you should determine that there is adequate funding for the duration of the proposed project. The mentor is required to fund the stipend, health insurance and tuition beginning in the 13th month of the student’s graduate years until the student returns to medical school. Choosing a mentor that you are personally comfortable with is also an important consideration. Before choosing a laboratory, you must speak with the MSTP Program Director. He/she will provide you with a list of potential mentors. Once you have chosen a mentor, be sure to get the Program Director’s approval before you start work in the laboratory. At the end of the rotation, you will be asked to fill out a form to evaluate your rotation.

A good source of information for choosing a laboratory and mentor are the webpages of department and program faculty. Go to http://academicdepartments.musc.edu/grad/index.htm and visit the Departments/Research Training Programs. The program director is also available to help with this process. Look up papers written by the faculty you are interested in, and get advice from others, particularly other graduate students. Attend seminars given by those you are considering as mentors. And finally, arrange a time to sit down and talk to the mentor of interest. Don't be afraid to ask questions about the research, about his/her state of funding, most recent papers, where he/she did their dissertation, and post-doctoral fellowship, etc.

Selection of an Advisor

Doctoral students may have as the Chair of their Advisory Committee only individuals who have competitive extramural funding. The selection of a mentor is a critical decision in your research career. You should seek much advice both from fellow students and other faculty in the program, as well as requesting your potential advisor’s C.V. and inquiring as to funding status. It is very unfortunate when the approval of an advisor cannot be granted at the Dean’s level. This is disappointing to both the student and the advisor and can often delay the student as the student must then rethink research options. Therefore, please keep in mind this issue of funding in selecting an advisor.
Here are a few more tips that should help you select an advisor:

1. Ask your department and other students for advice.
   Talking with students is a great way to find out how an advisor interacts with his/her students. Although you will probably not get specific recommendations from faculty, if you ask whether or not a supervisor has a past history of complaints you should get an honest answer.

2. Read and listen.
   Read through the Faculty Research Interests booklets and visit departmental websites—but keep in mind that these sources are not all-inclusive and may not be up to date. Go to seminars—you may find someone you have never heard of doing really interesting work. Read published papers by the principal investigator you are interested in. Attend or audit courses given by these professors.

3. Ask questions concerning a potential mentor.
   - Is your advisor well-established in the area of research/scholarship you intend to pursue?
   - Is his/her critical or theoretical orientation consistent with yours?
   - What is the reputation of the advisor within the discipline?
   - What does the advisor expect from his/her students?
   - Does the advisor closely supervise students?
   - What kind of funding will be available for my support?
   - Does the advisor hold lab meetings, journal clubs, etc.?
   - How much freedom will I have in designing my own project/choosing my dissertation topic?
   - How many papers am I expected to publish?
   - Do students attend national meetings and present posters and/or papers?
   - How much research is collaborative with the advisor and other labs?
   - Is the advisor engaged in patentable/saleable work? If so, how does he/she assign credit to the student? Does the work get published promptly?
   - Does the advisor have good relations with other faculty in the program?
   - How long has the advisor been on the faculty?

   There are advantages and disadvantages to being one of the first members of a new research group. On the positive side, you often have more freedom to choose your research topic and to influence the direction of the group’s research. On the negative side, you may be more isolated since there won’t be older graduate students in the group, and your advisor won’t have as much experience.

   - Is the advisor likely to remain on the faculty for the duration of your degree work?

   Make sure you are comfortable talking to the mentor, and ask questions if you don’t understand something. Pay attention to how interested he or she is in what you have to say. If asked, be honest about what you expect from a mentor and about how hard you are prepared to work. It is also appropriate to ask for your potential advisor’s curriculum vitae, biographical information, and/or publication list. The College of Graduate Studies has a Graduate Student Mentor Compact that lays out expectations for both parties. This must be reviewed and signed at the time of the formal selection of a mentor. The Compact can be found at http://www.musc.edu/grad/students/index.html

4. Work in the lab before you commit.
   Attend their research group meetings regularly. Give them a copy of a research proposal if you have a good idea of what you want to work on, and ask for comments.
5. Talk to past and present members of the lab.
   This is VERY IMPORTANT! It is important to find out how the advisor interacts with others and handles stressful situations such as bungled experiments. If the advisor is hesitant about your speaking to members of the lab, beware! It is very important to talk to as many people as possible, because a first year student will undoubtedly have different needs and expectations than an experienced postdoc. Remember, you will need to work with these people every day! Try to assess if they are receptive to you joining the lab, if they will be helpful, or if they will be competitive.

6. Know your work style.
   The type of relationship that each student needs with an advisor will be different. Some students prefer to be given more direction, to have frequent contact, and to be "checked up on." Others are more independent. Some may need contact but are self-conscious about asking for it. Other things that vary include what kinds of feedback are preferred (lots of “random” ideas vs. very directed feedback or pointers), working individually vs. in groups, working on an established research project vs. a new, independent effort; working in the same area as your advisor or doing an “outside” thesis.

Choosing a Dissertation Committee / Committee Meetings

Committee Selection: This is equally as important as choosing your advisor!

- Your advisor will figure into this selection in a major way, but you will have the final responsibility of putting the committee together. Talk with your mentor about any collaborators he/she has on campus. That might be the place to start.
- Most importantly, make sure all of your committee members get along.
- Choose committee members in a similar fashion as you chose your advisor: interview prospective members, talk to other students who have prospective members on their committees, etc.
- All of the members of your committee should be able to contribute to your project in some way. Weigh their areas of expertise and their reputations so you can be sure of good guidance throughout your thesis/dissertation work.

Committee Meetings

- Make sure that your committee has been approved by the Dean by turning in a list of your committee members to the graduate office.
- The first time your entire committee meets and hears your proposal is usually at the research proposal/oral examination. However, you must present a copy of your written proposal to your committee a few weeks prior to the defense. That way, your committee feels involved in your work, and you can anticipate any weak areas. But, do not show them more than one or two drafts. You don’t want to be caught in an endless draft revision cycle and never get to the exam.
- Talk with all your committee members often. You are required to meet with your committee every 12 months. However, it is generally a good idea to meet with your committee more often (2-3 times per year) if possible. Confirm that everyone knows what you have planned for your dissertation. The goal is to keep them informed, so
there are no surprises (e.g., extra month of experiments) the last month/week/day before your defense.

• Be sure that your personal “deadlines” and goals for completing your project are known. You may want to provide a timeline or checklist and/or progress reports for your committee so everyone may keep up with your progress. Providing coffee and/or snacks are a nice touch for committee meetings. Everyone is more agreeable on a full stomach!

• For all forms and guidelines go to our website at:
  http://academicdepartments.musc.edu/grad/curr_students/forms_guidelines.htm/

Big Brother/Big Sister Program

The Big Brother/Big Sister program was started in 1995 as a way to help new students in the Program through the sometimes difficult process of getting started in the MSTP. Each new student in the Program is assigned a Big Sibling, a student who has completed at least two full years in the Program. For the new students, this provides a dedicated “answer-person” who can help them through the difficulties of getting started. It’s also nice to have a familiar (and maybe even smiling) face in the crowd and to be able to talk to someone who is actually surviving the process. For the more experienced students, this provides an opportunity to get to know the new students and to share their experiences in a way that is beneficial to others. For this program to work, the Big Siblings commit to being ready and willing to listen and help out in any way they can and the Little Siblings graciously commit to not worrying about asking stupid questions. During the first summer shortly after all the first year students arrive, a lunch is held for everyone to meet informally.

Quarterly Student Lunch Meetings

As part of ensuring smooth transitions and peer mentoring, the MSTP has quarterly lunch meetings. Students in the M1, M2, G1 and G2 and in a separate meeting G2, G3, M3 and M4 students meet quarterly. During the meeting, issues that have arisen are discussed and the more senior students provide advice on a variety of topics. Some of the topics have included choosing a lab, discussions about mentors, making the transition from medical school to graduate school and graduate school to medical school. Since the program director, associate program director and assistant program director are present at the meetings, if administrative assistance is needed for some issues, the staff can help provide the assistance in a timely manner. These meetings also provide the students with an opportunity to have significant input into the structure of the MSTP.

Progress Committee

One of the subcommittees of the MSTP Steering Committee is the Progress Committee. The committee meets with each student every six months during the first two years of medical school and then annually after that to ascertain that the students are progressing in a timely manner. Students in the program are expected to maintain an average GPA of 3.0 or better during their tenure in the program. If the GPA falls below 3.0, the Progress Committee may request a meeting with the student to assist them in planning a course of action to remedy the deficiency. During the graduate school portion of the student’s training, the progress of the student is primarily the responsibility of the student’s mentor and dissertation committee. However, the Progress Committee meets with the student on an annual basis during the graduate years.

Provided on page 31 is a tabulation of all of the milestones and requirements that need to be achieved in order to obtain both the M.D. and Ph.D. degrees. Once you have chosen a
mentor, you should give a copy of this form to her or him. As you progress through the program, you should mark off those milestones that you have achieved. At the same time, you should periodically check the form to be sure that you are progressing in a timely manner.

**Scholarship Committee**

This committee is responsible for awarding program scholarship funds and NIH fellowships to selected students.

**Research Days**

*MSTP Research Retreat:*

MSTP Annual Research Retreat, not to be confused with MUSC’s Perry V. Halushka Student Research Day, is a requirement of the program and is a chance for the students in the program to interact with and present their research to individuals involved in the MSTP. The MSTP research retreat is well attended, and the audience includes MSTP students, student mentors, MSTP Steering Committee members, departmental chairpersons, and admissions committee members. MSTP research retreat is an informal and enjoyable day with casual dress and relaxed mood. Attendance at the MSTP research retreat is a requirement of the program.

Abstracts will be requested approximately one month prior to the event, and submissions are required by all students doing research. Accepted abstracts, as well as the order of student presentations, are included in a program distributed at the MSTP research retreat. Students are notified prior to the meeting of the time of their presentations.

The meeting is scheduled for one Saturday starting around 8:30 a.m. and lasting into the late afternoon. The day begins with a light breakfast and a poster session, followed by Dr. Halushka’s opening announcements, which include a brief summary of individual student achievements over the past year. The opening announcements are followed by student oral presentations. After the student presentations, a guest speaker, a graduate of the MUSC MSTP program, gives a 45-minute talk on his or her current research. All the participants then enjoy a catered lunch. In the afternoon, there are discussion groups, team building exercises and a business meeting followed by dinner, including guests.

*MUSC Perry V. Halushka Student Research Day*

In November, there is an annual campus-wide research day. MSTP students are strongly encouraged to submit abstracts and make presentations. You should submit your abstracts using the following guidelines. For the first three years that you are in the program, you should submit your abstract in the Ph.D. Years 1 and 2 category. For all subsequent years, you should submit your abstract to Ph.D. Years 3+. If you have any questions concerning this, please do not hesitate to contact Dr. Halushka or Dr. Kubalak, the Chairman of the Student Research Day Committee.

**Seminar Series**

*Monthly Research Seminar*

A monthly research seminar series is sponsored by the program. The series is organized by the students and is held on the fourth Monday of each month at 5 PM. Dinner is provided and attendance is a requirement of the program. The informal nature of the series allows for maximal scientific as well as social interactions. Speakers are either mentors, former mentors, or potential mentors for the students.
Practice Dissertation Defense

During the spring semester, additional dates are set aside for the more senior Ph.D. students to present their research, often as a practice for their dissertation defense. Attendance at this is a requirement of the program and an excellent learning experience for you to prepare for your own defense.

Translational Medicine Seminars

In some months, in lieu of the faculty seminars, a senior student presents a clinical case in a disease area in which they are interested. The case presentation lasts roughly 5 to 10 minutes. After that, a physician-scientist discusses the case from a clinical and research perspective. Students get a chance to see the case discussed from a more scientific approach compared to what they might see on the wards or in the clinics. They are able to see how one can bring science to bear on the understanding of pathophysiologic processes and the development of new therapeutic approaches.

Senior Panel

One evening after Match Day is devoted to the senior students talking about their experiences looking for internship and residency positions. This includes FAQs that are very helpful. This is followed by a celebration of their successful match process.

Senior Dinner

During the week of graduation, the Directors host a dinner for the graduating seniors in celebration of their successful completion of the program and their moving on.

Med to Grad Summary

• Part 1 of the USMLE. It is recommended that you schedule the test for no more than 1 month after completing Med 2 classes.
• You are required to be working in your lab no later than July 1
• Summer registration – you will register for 15 hours of research lab in your area of interest
• Fall registration – you will register for ESP I-Responsible Conduct (CGS 710, 1 hr), Diversity in Science (CGS 711, 1 hr), Important Unanswered Questions (CGS 760, 1 hr), any seminar or course work required by your PhD department, Research lab 970 for remaining hours to total 15 hours.
  [CGS 711 & 760 are both listed as Monday at 1pm. They are alternate weeks]
• Spring registration - Important Unanswered Questions (CGS 760, 1 hr), Cellular Signaling Development course (MCBP743), any seminar or course work required by your PhD department, Research lab 970 for remaining hrs to total 15 hours.
• Summer of 2nd year – you will register for ESP III-Grant Writing (CGS 712, 2 hr)
• Vacation Policy – During the time that you are a graduate student, your vacation time is dictated by the College of Graduate Studies Vacation Policy, which does NOT include the College of Medicine breaks.
• Determine who your graduate coordinator is and meet with him/her as soon as you enter graduate school.

Forms: (To be submitted to the CGS Registrar, Dodie Weise)

• Appointment of Major Dissertation Advisor – to be completed by the end of the fall semester of your 1st Grad year
• Program of Study – within 3 months of organizing Advisory Committee and before scheduling the qualifying exam.
• Recommendation for Appointment of Dissertation Advisory Committee – to be completed 6 months after successfully completing written qualifying exam. It is advised to appoint your Advisory Committee as soon as you can.
• Annual Evaluation of Student Progress by the Dissertation Committee Form - Once an Advisory Committee is formed it must meet at least once a year
• Plan of Research – to be completed no later than 6 months after passing the qualifying exams.
• Admission to Candidacy – Upon completion of the Program of Study, the qualifying exams and approval of the research proposal. At least 1 year prior to completing requirements for the degree.
• Dissertation Defense Notification – at least 3 weeks prior to the defense date.
• Dissertation Defense Rubric – submitted after defense to Dean’s office.

Ph.D. Didactic Requirements

The College of Graduate Studies requires a minimum of 12 hours of advanced course work for the Ph.D. degree. MSTP students are required to take the Essentials of Scientific Practice I and II-CGS 710, 711 and the Important Unanswered Questions in the Biomedical Sciences-CGS 760 seminar series in their first year of graduate school. Essentials of Scientific Practice III-CGS 712 is required the summer after their first year of graduate school. The College also requires demonstration of competency in statistics as a part of the PhD degree. You should either enroll in CGS 700 or speak to the course director about exempting out of the course. MSTP students may also be required to take units from the first year curriculum. This is at the discretion of the program coordinator and mentor. The student shall follow an individual Program of Study designed in consultation with the Dissertation Advisory Committee and approved by the Graduate Training Committee of the department or program.

The granting of the doctor of philosophy (Ph.D.) degree is based on evidence of general proficiency and distinctive attainments in a special field, particularly on the demonstrated ability to carry on independent and original investigation. The degree is not one to be conferred solely as a result of study for a specific length of time with the accumulation of credits taken.

Signaling in Development (MCBP 743)

In response to the students’ desire to learn more about analytical techniques, the steering committee approved requiring all MSTP students to register for MCBP 743. This course is literature based, relies on student participation and has a focus on analytical methods.

Registration

All students in the graduate years are required to register through their graduate coordinator at the beginning of each semester. At the time of registration, a schedule of courses for the upcoming semester will be emailed to each student. Courses may be chosen from this list, and the approval signature of the graduate coordinator or the chairperson of the student’s advisory committee is required.

A graduate student who has completed all the requirements for a degree and plans to write the thesis/dissertation must register until completion of a successful defense. Students on stipends are required to maintain full-time status at all times. This requires registration for a total of at least 15 hours per semester.
Graduation Requirements Outline/Checklist

Listed on the following page is a brief outline of the requirements for graduation. Those items marked with three asterisks (*** ) require the formal submission of a written form. These forms are available from the graduate program coordinator, the Graduate Office, or the Graduate School website. All students are encouraged to make themselves familiar with the detailed information regarding the College requirements as stated in the current University Bulletin. It is the responsibility of the student to be familiar with the requirements of the particular program in which they are enrolled. It is possible that the program may have more stringent requirements to which the student must adhere. If you have any questions regarding program requirements, you should consult your program graduate coordinator.
<table>
<thead>
<tr>
<th>Forms</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Selection of Major Dissertation Advisor</td>
<td>The major dissertation advisor should be selected no later than the end of the fall semester of the first graduate year.</td>
</tr>
<tr>
<td>2. Dissertation Advisory Committee</td>
<td>After passing the Departmental Written Exam</td>
</tr>
</tbody>
</table>
| Advisory Committee shall consist of 5 members, 3 from the student's major program and 2 from outside the program. All members of the committee shall be members of the graduate faculty. | Major Dept. _____________
Major Dept. _____________
Major Dept. _____________
Outside Dept. _____________
Outside Dept. _____________
Department Chairperson must send form recommending committee to Dean. *** |

**Annual Meeting Required**

| 3. Program of Study | 3 months after Dissertation Advisory Committee organized. Complete before scheduling qualifying examinations. *** |
| 4. Qualifying Exam | Schedule as soon as possible after completion of Program of Study. Obtain certificate of eligibility from advisor. See individual Department. *** |
| 5. Plan of Research | Due no later than 6 months after passing qualifying exams and before beginning research. *** |
| 6. Admission to Candidacy | Recommendation for candidacy is included in the eligibility form to the Dean at least one year prior to completion of degree. *** |
| 7. Research Seminar | Determined by Department and Advisory Committee. |
| 8. Dissertation | Draft and form due 3 weeks before final exam. (Submit form for Date/Time/Title/etc. *Refer to Guidelines for Thesis/Dissertations. *** |
| 9. Residence | At least 12 months of residency at MUSC. The following is only applicable after all research is completed and the student is preparing his/her dissertation. |
| 10. Final Exam | Defense of dissertation. A formal presentation with slides at least 30 minutes long before the entire department or program. An additional defense of the dissertation research takes place afterwards with the student’s Advisory Committee. (Refer to Thesis/Dissertation Guidelines.) *** |
| 11. Dissertation Rubric | Must be turned in to the Graduate School Dean's office after defense. |
| 12. Completion of Dissertation | Must be completed within 30 days of final defense or register for 1 hour the following semester. For MSTP students, the failure to complete within 30 days may result in withholding of stipend. |
| 13. Exit Interview | Exit interview with the Dean of the College of Graduate Studies |
Dissertation Advisory Committee

The major advisor should be selected no later than the end of the fall semester of the first graduate year of study. The Dissertation Advisory Committee shall consist of at least five members, three from the student's major department and two from outside the department. The chairperson (advisor) and all but one member must be members of the graduate faculty. The chairperson must be a full member of the Graduate Faculty. The Chairperson will be responsible for coordinating the activity of the Dissertation Advisory Committee and ensuring compliance with graduate school regulations.

A Dissertation Advisory Committee shall be chosen by the student with the proposed dissertation advisor and the names forwarded through the departmental graduate coordinator for approval by the Dean. The Dissertation Advisory Committee should be organized after passing the departmental written exam.

The student is required to meet with their Advisory Committee at least once a year until they have met the requirements for the Ph.D., but it is better to meet much more frequently. In addition, the department may have additional rules and/or requirements, so be sure to check with the departmental graduate coordinator. The departmental coordinator and the Dean should be notified in writing of the annual meetings by the Chairperson of the Dissertation Advisory Committee. Meetings may be called at the discretion of the student, the advisor, or if two or more members of the Dissertation Advisory Committee request such a meeting.

To decide on the members of the Advisory Committee, the student should discuss with their faculty mentor who would contribute most effectively to their research, training, and the completion of the project. The Committee members need not be experts in the student's field, but they should bring special skills to the Committee that will help the student be more effective in the overall process of completing their work in the laboratory. The student should choose people that they and their mentor respect for their scientific insight and broad knowledge of the field. These should also be people easy to talk to and learn from, as they will be helping to guide the course of the student's research. The student should be sure to speak to each prospective member personally and ask if they would be willing to serve on the Committee, remembering that they are not required to do so. When the student has secured four positive responses in addition to the mentor, the student is to get the “Appointment of Advisory Committee” form which is available from the Registrar in the Graduate Studies Office, and have it signed by all the appropriate people.

An initial Committee meeting should be called—the student may want to get acceptable times over the phone, but remember to send each member advance notice in writing and a short reminder the day before—and get them up to speed on the project and where it's headed. Remember, the sooner the Committee gets a feel for the project, the sooner they will be able to guide the student in maximizing their effectiveness and avoiding pitfalls. The student should try to write their plan of research early rather than later in the course of their dissertation research.

Program of Study

The Program of Study is planned in a joint meeting of the student and his/her Dissertation Advisory Committee. The program is a list of courses and other requirements, including those of the major department, which the student must complete in order to meet the minimum program requirements for a given degree. After approval by the Dissertation Advisory Committee, the Program of Study is filed with the departmental graduate coordinator and with the office of the Dean within three months after the Dissertation Advisory Committee is organized. The Program of Study does not require approval by the Graduate Council. A decision to remove, substitute, or add courses to the Program of Study can be made in a joint meeting of the student and the Dissertation Advisory Committee and by a unanimous vote of that committee. Any changes in the program must be completed no later than one week after the substituted or additional course has begun. A record of any change in the program will be
submitted by the Dissertation Advisory Committee Chairperson to the office of the Dean. In addition, it will be the final responsibility of the student and his/her Dissertation Advisory Committee Chairperson to ensure that any change in the Program of Study is consistent with the maintenance of at least the minimum course requirements of the major department.

The committee, in consultation with the student, will prescribe additional course work needed to complete the departmental requirements for graduation and other course work or areas of study needed to remedy deficiencies in the student's background to ensure successful completion of the proposed dissertation. The Program of Study must be completed before scheduling the qualifying examinations.

Courses Audited

Any graduate student, with permission of the instructor and the Chairperson of the Dissertation Advisory Committee, and with written notice to the Graduate Office, may audit a course. Audited courses are not part of the Program of Study and will not be given credit.

Repeating Courses

The Dissertation Advisory Committee may permit a student to repeat a course in order to raise the grade. Courses that have been repeated will be treated as follows: (1) Credit hours will be granted only once. (In computing the overall average to determine eligibility for degrees or in rulings on probationary matters, the credit hours must be counted twice and both grades included.) (2) The transcript must show both grades, with the second being designated as Repeated, and credit hours being given only once.

Qualifying Examination

An applicant will not be admitted to candidacy for the Ph.D. degree until he/she has passed a comprehensive qualifying examination. This examination is intended to test his/her general knowledge of his/her major field and related fields of study. Failure to pass any part of the examination requires a reexamination in areas not completed satisfactorily and will be permitted only once and after not less than three months of further study.

The nature of the examination in the major field is determined and conducted by the major department. The College of Graduate Studies does not require that qualifying examinations be given in courses earned as credits outside the major department in related fields. The student is advised to consult the major department to determine departmental requirements in the area of qualifying examinations.

Plan of Research

Prior to a student being certified as a candidate for the Ph.D. degree (no later than six months after passing the qualifying examinations), he/she will submit a research proposal, in NIH grant format, on the dissertation topic. This proposal should show evidence of creative integration of course material, superimposed on a sound understanding of the pertinent literature. The topic chosen for the Ph.D. dissertation shall be approved by the advisor and the department chairperson, the latter with regard to availability and utilization of departmental resources.

The Dissertation Advisory Committee will critically review the written proposal. The student should understand that the proposal will be acceptable only if it is imaginative and provides a scientifically rigorous test of a meaningful hypothesis. The proposal may be strengthened with data from preliminary experiments.

Within two weeks of the submission of the written proposal to the committee, the student will present and defend the research proposal orally before the committee. The student will be questioned on those methodologies and background areas needed to successfully complete the proposed research.
Admission to Candidacy

Upon completion of the Program of Study, the qualifying examinations, and approval of the research proposal, the Dissertation Advisory Committee recommends that the student be admitted to candidacy. Such admission to candidacy must occur at least one year prior to completing requirements for the degree.

The graduate school recognizes that the student's research may deviate substantially from that originally proposed. The student should be encouraged to pursue promising leads; however, long-term changes in the direction of the student's research should be done in consultation with the Dissertation Advisory Committee.

CARES Clinic

The CARES Clinic is an evening clinic that serves the medically uninsured and underinsured community. MSTP students who have completed at least 2 years of medical school attend. However, MSTP students are required to attend at least twice for each year they are in graduate school.

Residence

At least one year of residency at the Medical University is required before receiving the Ph.D. degree. A graduate student who has completed the requirements for a degree and is receiving a stipend must register for at least 15 hours per semester.

Research Seminar

Students are required to make a research presentation, on campus, in a manner to be determined by the department or program and the Dissertation Advisory Committee.

Dissertation

A dissertation, based on original investigation, is required which gives evidence of mature scholarship and critical judgment, indicates knowledge of research methods and techniques, and demonstrates the ability to carry out independent investigation. Preparation of the dissertation may comply with the regulations contained in A Guide to the Preparation of Theses and Dissertations, which is available in the Graduate Office or through the CGS website.

Final Examination

Each candidate is required to pass a general oral examination directed primarily to the defense of the dissertation. This shall begin with a formal presentation with appropriate slides and shall be at least 30 minutes, and preferably 45 minutes, in length for the Ph.D. candidate.

The examination is conducted by the Dissertation Advisory Committee, with its Chairperson presiding. The Dissertation Advisory Committee will have primary responsibility for evaluating the student's research, including the written dissertation, the formal oral presentation (which is open to the general graduate faculty), and for administering the final oral examination.

Approval of the Dissertation Advisory Committee, with no more than one dissenting vote, is necessary for recommendation for awarding the degree. The decision of the Advisory Committee will be forwarded to the Dean. The graduate faculty has the authority, which it has delegated to the Dean, for final approval of the candidate for the awarding of the degree.

In the event of disapproval, the candidate may be permitted to retake the examination in not less than six months and not more than two years from the time this decision was made. Only one opportunity for re-examination is given. Any candidate who is granted this privilege shall retain the status and obligations of a graduate student until the time of such re-examination.
Notice of Final Defense

All “Notice of Final Defense” forms must be received in the Dean’s Office of the College of Graduate Studies three weeks prior to the date of the Defense. The reason for this rule is so that the Defense can be advertised well enough in advance to allow all interested parties to attend. By the rules of the College of Graduate Studies, all Graduate Faculty may attend the Defense of a master’s or doctoral student and participate in the questioning of that student; only the advisory committee will be permitted to vote on the student’s performance on the exam.

The “Notice of Final Defense” form must be signed by all advisory committee members. The committee members should have read your dissertation prior to signing this form to insure that the dissertation is of a caliber to be defended. Signing this form does not state that revisions will not be needed. Indeed, there usually are final revisions after this point. However, it does establish that each committee member is satisfied that the body of work is appropriate for Defense and that the dissertation is written in a manner to be worthy of Defense.

Please arrange your schedule so that the committee members have an opportunity to examine your dissertation before signing the form. Do not expect the committee members to sign the form when you first submit the document to them. Depending on each individual committee member’s schedule, it may take some days to several weeks before they are able to examine the dissertation and sign off on the form.

It is the student’s responsibility to assure that the timing of this initial review of the dissertation and the defense itself is such that the committee members will be available for both the reading of the dissertation and attending the defense. A handy rule of thumb is for the student to allow themselves at least one month from the time they submit the final draft to the committee in order to receive sign-off approval by their committee that the dissertation is ready for defense, defend the dissertation, make the necessary corrections to the dissertation, and submit the final dissertation to the Dean’s Office.

We appreciate your cooperation with these College of Graduate Studies regulations. The dissertation is a final, complete accounting of one’s doctoral research. It is the most valuable documentation of your research project. The dissertation will require a great deal of effort and time to prepare. Please remember this when making your schedules. The Ph.D. degree is not awarded until the final dissertation is turned into the College of Graduate Studies Dean’s Office.

The College of Graduate Studies has implemented the following policy. The final signed dissertation must be in the College’s office no more than 30 days after the successful oral defense. For MSTP students, this means that the stipend may be withheld if the dissertation is not in the College’s office by that time.

Tips From Your Colleagues
(Refer to Graduate School Handbook)

Your years in graduate school will culminate in the writing of your thesis/dissertation, which describes your research and discusses your important findings. For the most part, you will have a final committee meeting when your committee gives you the go ahead to finish up any final experiments and begin writing. The actual writing of the thesis/dissertation is a process unique to your project and department. It is at this point that you realize the importance of a well-organized lab notebook so that you can remember the significance of data that you collected years ago! Your proposal and published papers often provide a good framework from which to start writing your thesis/dissertation. It is a good idea to read other dissertations from your department to get a feel for how successful ones are organized.

The CGS Dean’s Office also provides “A Guide to the Preparation of Theses and Dissertations” (see Dodie Weise or the CGS website under current student information for a
copy). The guide also recommends other style guides/manuals that may be useful. You should also consult your advisor and committee for further advice.

Writing the dissertation will usually take 3-6 months, depending on your project, advisor, etc. Also, plan to remain on campus at least one month after the defense in order to allow time to make any revisions that may be required. How much time you have to finish also depends on how much longer your financial aid/stipend can last, so be sure to clarify how you will be paid during this time. Don't forget that you must be registered for at least one credit hour each semester until your defense.

Once you have completed a final rough draft, you must distribute a copy to your advisory committee for their review. When your committee has approved your draft, they must sign a form stating that your dissertation is ready for defense. (Appendix C) The Notification of Defense form must be submitted to the Graduate Office THREE weeks prior to the defense giving the title, place, date, and time of the defense. Also be sure to understand your program or department's rules for the seminar format i.e., length, style, who can attend, who votes on whether you pass/fail. Some departments require only your committee conduct the oral exam and vote, other departments allow all department faculty to participate.

In the defense of the research proposal, it is common for there to be emphasis on knowing relevant background information, understanding methods, and having an idea about how to interpret expected data. In the FINAL defense, you are expected to communicate your understanding of the BEFORE and AFTER. That is, BEFORE your project, little was known/understood about Subject X. You will be expected to interpret the actual data and its significance with regard to what was previously understood. Then you must discuss what comes AFTER your project, that is, what are the new questions that your research has raised and how can such questions be addressed? In simpler terms, what would you do next?

Following the final approval by the advisory committee, dissertations are to be deposited in MEDICA, MUSC's Institutional Repository within 30 days. This will be submitted as a pdf to http://medica.library.musc.edu/submit. Failure to do so may result in the suspension of the student's stipend.

**Extramural Fellowships and Scholarships**

The MST Program strongly encourages all students to apply for extramural fellowships and/or scholarships. MD/PhD students are eligible for F30 or F31 NRSA fellowships. Our students have been very successful exceeding the national average success rate by greater than two-fold in obtaining these fellowships. MSTP students are very strongly encouraged to apply for F awards. The NRSA F application has a specific requirement for a description of the MSTP. This can be found in Appendix A. Funding opportunities and Guidelines for Reviewers are also provided in Appendix A. Students receiving an extramural fellowship or scholarship that pays 60% or more of their tuition receives an additional $1500 added to their stipend by the Dean's office every year that the fellowship is in effect. For scholarships or fellowships that pay less than that amount, there is a pro-rated bonus to be negotiated with the mentor.

**Translational Sciences Clinic**

Course Director
Perry V. Halushka, Ph.D., M.D.
Course Number MDCOR 871

The goal of this requirement is for MSTP students to learn how to better integrate the basic sciences and their area of research interest with a meaningful clinical/translational experience. The students are expected to discuss the patient’s problems from a literature/research perspective. They will work in a clinic, one-half day a week with an
extramurally funded clinician-scientist who is chosen based on his/her demonstrated commitment to research. All MSTP students are required to register for two (2) semesters of this clinic. It is suggested that the student participate in the clinic during their second or third year of graduate school. The student receives 3 weeks of junior selective credit for the 2 semesters. The mentors for this elective could help the students with a potential clinical study that may evolve from their basic science project. The course plan for the Translational Sciences Clinic follows:

Objectives: 1) Create an environment where students begin to develop an appreciation for the process of translational research. 2) Introduce students to mentors who can serve as role models.

Structure: 1) Requires prior approval from dissertation advisor and graduate program coordinator, 2) Students attend clinic no more than one half-day a week and with the same faculty mentor, 3) One semester blocks and 4) Program will be pass/fail/honors and 5) the two semesters may be used to satisfy three weeks for a clinical elective for the junior year of medical school.

Choosing Mentor: 1) A list of mentors who are clinician-scientists is provided and approved by the Associate Program Director and/or Program Director. 2) Whenever possible and/or appropriate the students will choose a mentor/clinic that is related to their dissertation research.

Schedule with Mentor: 1) Introductory period to gain familiarity with the clinic. 2) Mentor assigns patient(s). 3) Students will evaluate no more than one new patient per clinic and will see their return patients. 4) Students are responsible for patient care (history, physical examinations, diagnosis and treatment plan) while the patient is under the care of that clinic.

Clinical Research: 1) Students will research the latest concepts concerning the patient’s disease and discuss them with the clinician-scientist.

Expectations of Students: Students are expected to: 1) demonstrate a detailed understanding of the pathophysiology and treatment of the disease, 2) provide support for diagnosis and treatment that they propose, 3) demonstrate knowledge of current literature and provide references and 4) acquire proficiency in the history and physical examination.

Expectations of Mentors: Mentors are expected to: 1) constructively challenge student’s knowledge of current research literature, 2) practice evidence based medicine and 3) help the student gain skills in the history, physical examination, differential diagnosis and treatment.

Evaluation of the MSTP clinic in translational sciences: Both students and mentors will be required to fill out an evaluation form at the end of each semester.
Mentor Evaluation of the MSTP Student in Translational Sciences Clinic

Mentor_________________________________

Student________________________________

Term __________________________________

The student was able to effectively integrate current scientific literature into the diagnosis and treatment plan. 1 2 3 4

The student conducted effective literature searches for the specific disease topic. 1 2 3 4

The student demonstrated progress in mastering clinical skills. 1 2 3 4

The student displayed enthusiasm for integrating current research literature with clinical problems. 1 2 3 4

The student was able to conceptualize research questions that integrated current literature and disease states. 1 2 3 4

The student challenged you scientifically in an appropriate manner. 1 2 3 4

Overall evaluation Fail Pass Honors

I have discussed this evaluation with the student. Yes No

Comments:________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Student Evaluation of the Mentor for Translational Sciences Clinic

Mentor_________________________________
Student________________________________
Term __________________________________

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<thead>
<tr>
<th>Statement</th>
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<td>My mentor challenged my understanding of the scientific literature.</td>
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<tr>
<td>I learned how to begin to integrate the latest scientific information into concepts of improving understanding and treatment of diseases.</td>
<td>1 2 3 4</td>
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<tr>
<td>This elective helped me to begin to understand how to integrate basic science into clinical investigation.</td>
<td>1 2 3 4</td>
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<tr>
<td>This has been a valuable experience.</td>
<td>1 2 3 4</td>
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Comments:__________________________________________________________________________________
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A MONTH IN THE SCTR RESEARCH NEXUS

Course title: A month in the SCTR Research Nexus

Duration: One month offered in the fall semester

Course Co-directors: Dr. Carol Wagner, Associate Director, SCTR Research Nexus
Dr. Perry Halushka
Course Number MED-832

The Month in the SCTR Research Nexus is a requirement of the program and is fulfilled during the senior year. The rotation is offered during the fall semester. This gives you an advantage when interviewing for internships and residencies.

The students present their final proposal to Dr. Carol Wagner, Dr. Halushka and other members of the SCTR Research Nexus staff. In addition, the students also present their proposal to their fellow MSTP students at a Monday Night Seminar.

Rotation Outcome/Expectations for MSTP Students:

- **Objective**: Develop an hypothesis-driven study in human subjects that is based on your dissertation research
- **Prerequisite**: Completion of the CITI Miami course – must submit certification
  - MSTP students should have done this as part of graduate school requirements
- **Current outcomes/expectations**:
  - Understand the principles and practice of clinical investigation
  - Learn some of the statistical approaches used in clinical investigation
  - Attend a SCTR Research Nexus Advisory Committee (GAC) meeting
  - Attend an IRB meeting
  - Develop and write a clinical investigation protocol and present it for approval to the SCTR Research Nexus advisory committee and course directors.
- Assignments will be given based on the weekly outcome and the steps needed for completion
- For MSTP students, the clinical study to be developed is based on their dissertation research. They will also have the opportunity to work with the appropriate clinical investigator.
- The study will require working with the support services of the SCTR Research Nexus.

Final Project:

- Develop and write a clinical investigation protocol, including the informed consent using the PHS 398 instructions for the R21 as an outline (table of contents and length)
- Emphasize R21, 4 questions (research plan four R’s)
- Presentation before SCTR Research Nexus Research Education Committee members during the final week of the rotation
- Presentation to MSTP students at Monday Night seminars

A. Assignments (A)

Assignment: meet as a group with a representative from the library regarding literature search engines and tools to help you as the investigator

B. Pieces of Rotation – See Appendix B for a typical month
AOA

Alpha Omega Alpha (AOA) is the national medical honor society, which recognizes outstanding medical students on the basis of academics, personal characteristics, leadership, and service.

Election to AOA is a process that involves two distinct steps. The first step involves nomination for AOA. Twenty-five percent (1/4th) of the junior or senior medical school class is nominated to AOA based on class rank (GPA). The second step involves actual election into AOA. All nominees are notified of their status and are asked to submit a curriculum vitae (CV). Nominees are asked to provide information concerning extracurricular activities, research experience, honors, awards, and service to community and school. Once the students are nominated, the list of nominees for election to AOA and their information sheets are presented to the members of the MUSC chapter of AOA, including current AOA students and faculty. The national guidelines state that no more than 1/6th (16.7%) of the medical school class may become AOA. Thus, not everyone nominated for AOA will be elected. Each medical school chapter conforms to national criteria for acceptance of students, but the national guidelines are subject to minor modification by the school. At MUSC, class rank carries the most weight during the election process, but AOA members can choose to not admit eligible persons if those persons do not meet the aforementioned non-academic criteria of acceptance into AOA.

The national guidelines read that “students first become eligible for AOA during the fall of the year prior to their final year” (junior year of medical school). For the MSTP student, this means that you will be eligible when you return to the clinics in your new medical school class as a junior clinical clerk. Twenty-five percent of AOA students will be elected in the fall of their junior year, whereas the final 75% will be elected in the fall of their senior year.

The AOA invites/nominates the top 25% of the junior and senior classes to submit applications for consideration for membership. Typically, 16% are selected; 10 junior and 16 senior. Students are considered based on the number of theme honors in Med-1 and Med-2 years. There are a total of 16 themes. A student needs to have at least 14 honors to be considered in their Med-3 year.

The basic formula for acceptance into the AOA is as follows:
- For Med-3 students; 60% = 2/3 Med1 and 2 grades + 1/3 board scores, 30% for the CV and 10% committee vote.
- For Med-4; 70% = 1/2 Med 1, 2 and 3 grades + 1/2 board scores, 20% CV and 10% committee vote.

Specific questions concerning AOA as it applies to the MSTP student should be directed to Dr. Halushka or Christopher Pelic, M.D., Councilor of the MUSC chapter of AOA.

Grad to Med Summary

Here is a brief summary of requirements and timelines for your dissertation.

- Submit “Entry into 3rd Year Medicine Rotations” form only AFTER no more experiments are required AND a rough draft of dissertation has been submitted to and approved by. PLEASE NOTE: Students are not permitted to begin rotations until this has been submitted to and approved by the program director. (See Appendix C)
- Writing the thesis/dissertation will usually take 3-6 months, depending on your project, advisor, etc.
- Once you have completed a final rough draft, you must distribute a copy to your advisory committee for their review. Please arrange your schedule so that the committee
members have an opportunity to examine your dissertation before signing the form. Do not expect the committee members to sign the form when you first submit the document to them. Depending on each individual committee member’s schedule, it may take some days to several weeks before they are able to examine the dissertation and sign off on the form. A handy rule of thumb is for the student to allow themselves at least one month from the time they submit the final draft to the committee in order to receive sign-off approval by their committee that the dissertation is ready for defense.

- When your committee has approved your draft, they must sign a form stating that your dissertation is ready for defense (Defense Notification). This form must be in the Graduate Office at least 3 weeks prior to the defense date.
- Following approval by the advisory committee, one copy of your unbound thesis/dissertation must be available in the Department no less than THREE weeks before the date of the defense. Also be sure to understand your program or department's rules for the seminar format i.e., length, style, who can attend, who votes on whether you pass/fail. Some departments require only your committee conduct the oral exam and vote, other departments allow all department faculty to participate.
- It is the student’s responsibility to assure that the timing of this initial review of the dissertation and the defense itself is such that the committee members will be available for both the reading of the dissertation and attending the defense.
- Remember, we always, when possible, want students to have a practice dissertation defense presentation to the entire MSTP student body.
- The final dissertation is to be deposited in MEDICA, MUSC's Institutional Repository within 30 days. This will be submitted as a pdf to http://medica.library.musc.edu/submit. Thesis/Dissertations must be submitted to MEDICA no later than the last day of classes for the semester. Failure to do so may result in the suspension of the student’s stipend.
- The requirements for the junior and senior years of medical school can be found in Appendix D.

Deadlines:
- All potentially returning students will attend the mandatory week of training and orientation typically held the last week of June
- Approval from MSTP for return to medicine for Block 1 (July) must be received by COM by May 31
- Approval from MSTP for return to medicine for Block 2 (mid August) must be received by COM by July 1
- If the student plans to return any later than block 1, they will lose their schedule
- If students have not defended prior to return to medicine, they must defend during the Christmas break or first week in January. If that is not completed, they can be pulled off of medicine rotations by the program director.
- No student may take extra time off during the rotations in order to prepare for their defense.

Junior and Senior Clinical Rotations

The requirements to enter the clinics after the completion of your research are relatively straightforward. (See Appendix C) You cannot enter the third year of medical school until you have completed your experiments, your written dissertation is approved by your mentor and dissertation advisory committee for oral defense. Your mentor must send the form “Entry Into 3rd Year Medical Rotations” (Appendix C) to the program director stating that you are ready to return to medical school. If you have not defended your dissertation before returning to the
clinics, you must defend at the Christmas break. Upon receipt of the completed form, the program director will forward a letter to Dr. Deas, the Interim Dean, College of Medicine, advising her that you have met your research requirements and wish to enter the clinics as a junior clerk.

Dr. Donna Kern organizes a refresher course for the history and physical exam for MSTP students prior to their entry into the third year of medical school.

Junior clerkships start the first week in July and are separated into six-week blocks for required clerkships and three-week blocks for selectives. You can start as late as the end of August and still graduate within the last two years of medical school. The Director of Clinical Coordination, Credentialing & Compliance for Medical Students in the Dean’s Office begins working with students around December of the year preceding the start of junior rotations to prepare for the clinical years. If you find yourself able to enter the clinics sooner than expected, but after December, the absolute latest time that you can be guaranteed a slot in the junior class is the first of May which is two months prior to the start of the first rotation. With such late notice, however, you will probably have no choice in the order of your rotations or in the location of your family medicine assignment. If you plan to enter the junior class after July, you still have to abide by the May 1 deadline since all assignments for the year are established at that time.

The general rule of thumb is that the earlier you notify the Dean’s Office, the better. However, the Dean’s Office is aware of the unique situations facing MSTP students with regard to scheduling of clerkships and will be more than happy to work with you any way they can.

Intern and Residency Programs

During the fall semester of the last year of medical school, students apply to internship and residency programs. The process for applying for internship and residency for MSTP students is similar to that for medical students. Graduates of the MSTP are highly sought after by the best post-graduate training programs in the country. During the interview process, MSTP students should inquire about research opportunities during their training period. For example, the American Board of Internal Medicine sponsors the Clinical Investigator Pathway training program for internal medicine training programs. This program is structured to allow for substantial research opportunities during the clinical training experience. This program is ideally suited for MSTP graduates. Dr. Halushka and Dr. Clyburn are available to help you with the selection process.

Dean’s Letter

As a part of your application for internship and residency programs, the College of Medicine Dean’s office writes a letter summarizing your performance in medical school. Dr. Halushka also writes a couple of paragraphs about your performance as a MSTP student. You should make an appointment to meet with him after you have met with the College of Medicine Dean’s office letter writer. When you meet with Dr. Halushka, bring a copy of your updated CV, a couple of paragraphs describing your research and your personal statement.

Travel and Meetings

The program sponsors travel for students who present abstracts at meetings. The meetings for which the program pays the travel expenses are the nationally organized research meetings, specifically structured for either MSTP or graduate students and must be pre-approved by the Dean. Funding for travel expenses to other meetings by MSTP students is the responsibility of the mentor in whose laboratory the student is working. The program strongly encourages the students to present their research at National Meetings.
The College of Graduate Studies provides $700 for Ph.D. students to travel to a meeting if they are presenting a paper. These funds are also available to you during your graduate years and must be pre-approved by the Dean.

Once approved by the Dean, the following procedures apply. Airline tickets and registration fees are the only costs that are allowable to be paid for in advance. Students need to identify the specific airline and flights that they are interested in prior to coming to the Dean’s Office to meet with Amy Connolly. Registration fees and airline tickets may be purchased via the internet or paid directly to a vendor. If purchased directly by the student, these costs are only reimbursable after the travel has been completed.

Reimbursement requests for travel related expenses must be submitted to Amy Connolly. Reimbursements will be either direct deposited or distributed by Amy Connolly approximately one month after receipt of claim.

The following information is required on all travel claims: your name, social security number and home mailing address. You must submit original receipts for all reimbursable expenses except for meals. If you purchased your airline ticket via the web, a computer printed receipt is acceptable. You must submit any left over pieces of your airline ticket along with your airline receipt. You need to submit a copy of your abstract and a copy of the cover and the page of a meeting booklet that lists your presentation.

Other allowable expenses include items such as airport parking, meals, mileage if driving, lodging, taxi fees to and from the airport/place of lodging. Mileage is reimbursed at $0.575 per mile (rate as of January 1, 2015). You must attach a web print (such as MapQuest) showing the mileage from your home to your destination if driving instead of flying. If you are driving out of state, you need to provide a copy of a web airline price quote to show that it costs less to drive than it did to travel by air.

Meal reimbursements are made via a per diem rate. The out of state rates are as follows: breakfast $7, lunch $9, dinner $16. You do not need to keep any receipts for meals. If you spend more then the per diem rate, you still will not be able to be reimbursed for anything above the per diem rate.

Vacation Policy

During the summer between the first and second year of medical school, MSTP students may take up to a two week vacation and are expected to be working in a summer laboratory rotation the remainder of the time. Upon completion of part one of the USMLE, you may take up to a two-week vacation, after which you are required to be working in the lab no later than July 1. After that, during the graduate school years, vacations should be taken following graduate school policies and approved by your mentor.

The policy of the Graduate School is that full-time students may be granted up to two weeks leave per year. The College follows the NIH vacation policy for all its trainees. Kirschstein-NRSA fellows may receive the same vacations and holidays available to individuals in comparable training positions at the sponsoring institution. Fellows shall continue to receive stipends during vacations and holidays. At academic institutions, the time between semesters or academic quarters generally is considered an active part of the training period and is not considered to be a vacation or holiday. Trainees must receive approval for their vacation from their mentor several weeks prior to the start date. Granting of leave is at the discretion of the program/mentor.

Requests for leave time exceeding two weeks cumulative may be granted at the discretion of the program/mentor with written notification to the Office of the Dean. For students on stipends, leave exceeding two weeks could result in stipend support being suspended until the student’s return to campus. For maternity/paternity related accommodations, please go to the following link.
Students in their first two years, who are taking didactic courses requiring one month or more leave during a single semester, are advised to request a formal leave-of-absence for that semester. If the student is on stipend, support will be discontinued for that semester. Students on stipends should be aware that their funding cannot be guaranteed upon their return from a leave-of-absence of more than one semester.
**Progress and Milestones**

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**Name ________________________________ Matriculation Date _______________

Date ___________ YEAR 01 02 03 04 05 06 07 08 09**
Appendix A

F Award Additional Educational Information Boilerplate
http://www.nigms.nih.gov/Training/IndivPredoc/Pages/Pre doctoral-F31-Sample-Applications.aspx
Other Attachments

The following additional educational information is required and should be attached under Other Attachments:

THIS SECTION SHOULD BE REMOVED IN THE FINAL VERSION

- Describe the institution's dual-degree program in which the applicant is enrolled. Provide some background on the dual-degree program including general program outcomes, such as the completion rate and the percentage of program graduates who are in academic research positions post-training. Describe the structure of the dual-degree program, and required milestones and their usual timing (e.g., number of courses, any teaching and clinical requirements, and qualifying exams). The sequencing of the applicant's graduate research and medical (or other health professional) school years should also be described. Describe the progress and status of the F30 applicant in relation to the program’s timeline, indicating when the applicant matriculated into the program and when the applicant is likely to transition to clinical years of the dual-degree program. Describe any clinical tutorials during the graduate research years and any activities to ease transition from the graduate to the clinical years of the dual-degree program. Describe any research-associated activities during the clinical years of the dual-degree program. Describe the frequency and method by which the program formally monitors and evaluates a student’s progress. This information is typically provided by the director of the dual-degree program or the department chair. The name of the individual providing the information should be included at the end of the attachment.
- Provide justification for the duration of support requested in terms of the research and clinical training proposed. Include the number of anticipated months of research training and of clinical training.
- Note that scores for standardized exams (e.g., MCAT, GRE) as well as a listing of the applicant’s courses and grades must be included in the Fellowship Applicant Biographical Sketch, and NOT in this attachment. PAY ATTENTION TO THE YELLOW SECTIONS. THEY ARE SPECIFIC FOR YOU.
- Please name this attachment “Additional Educational Information.”

The filename provided for each “Other Attachment” will be the name used for the bookmark in the electronic application in eRA Commons.

Additional Educational Information (required by PA-14-150)

Describe the institution's dual-degree program in which the applicant is enrolled. Provide some background on the dual-degree program including general program outcomes, such as the completion rate and the percentage of program graduates who are in academic research positions post-training.

Background: The Medical Scientist Training Program at the Medical University of South Carolina was initiated in 1980 and in addition to strong university support, has received continuous NIGMS (GM008716) support since 1999 and was recently renewed (May, 2014) for an additional 5 years, with the recommendation to increase the number of funded slots by one. The MSTP has graduated 100 students. Of the 38 students who graduated between 1982 and 2002, 3 are Professors who hold endowed chairs, 6 are Associate Professors, 7 are Assistant Professors, 5 hold clinical appointments, 5 are in private practice, and 2 are deceased. Many of this group have successfully competed for multiple research grants, including leadership of multiple NIH awards, including R01s, R21s, R03s, P-types, U-types, career development awards, Loan Repayment Program (LRP) awards, as well as VA Merit, American Cancer, American Heart and numerous medical research foundations. Of the 62 trainees who graduated between 2003 and 2013, 1 is an Associate Professor, 8 are Assistant Professors, 5 hold clinical appointments, 5 are in private practice, and 43 are still in training. Within the past 10 years, 4 students did not complete the dual degree program. All went on to medical school. The program currently has 56 students, with between 6 and 9 students graduating each year, many of whom go on to high profile residency programs (for current positions, please see http://academicdepartments.musc.edu/grad/programs/md_phsd_program/graduates.htm).
Describe the structure of the dual-degree program, and required milestones and their usual timing (e.g., number of courses, any teaching and clinical requirements, and qualifying exams). The sequencing of the applicant's graduate research and medical (or other health professional) school years should also be described.

Transition into the program: Students arriving on campus meet their program “big sibling,” a more senior student who has volunteered to serve as a resource for the more junior student throughout their joint time in the program. Once all the students arrive on campus, a lunch is held for all of them to meet each other and exchanged the appropriate social media contact information. The arriving student then begins their first summer rotation. A second rotation occurs during the summer between first and second year of medical school, with an option for a third rotation during the summer following second year of medical school. Students identify potential rotation mentors through departmental websites, meeting with the program director and the Monday night research seminar series or during translational medicine seminars. Students and mentors both formally evaluate the rotation experience and submit their reports to the MSTP office. The mentor is required to share the report with the student, however, the student is not required to share the report with the mentor. Students meet with the Program Director to discuss their rotation experiences and choose a dissertation mentor.

The MSTP is designed along the classical paradigm of two years (medical school coursework) + three to four years (graduate school) + two years (medical school clinical clerkships). Over the past ten years, the average time between matriculation and graduation has been 7.7 to 8 years.

Medical School: The first two years of the medical school curriculum is systems-based, with approximately one organ system covered every three to four weeks. The first year is devoted to the basic sciences with three courses per semester. These courses are Structure and Function (gross anatomy and normal histology), Molecules and Energetics (biochemistry and molecular biology), and Homeostasis and Regulation (normal physiology). The second year is devoted to the clinical sciences, with three courses titled Pathogens and Host Defense (immunology and microbiology), Altered Structure and Function (Pathology), and Pharmacotherapeutics and Nutrition (pharmacology). In addition, each semester includes a course titled Fundamentals of Patient Care. The course objectives include discussion of ethical issues, differential diagnosis, and development of history and physical taking skills. The format includes small group discussion, and interviews and physical exams of standardized (mock) patients during the first year and hospitalized patients during the second year. All courses are evaluated by multiple-choice exams, with Fundamentals of Patient Care additionally examining history and physical taking skills through Objective Structured Clinical Exams using standardized patients. Students complete the United States Medical Licensing Exam (USMLE) Step 1 after their first two years of medical school, and complete Step 2 (Clinical Skills and Clinical Knowledge) during their final year of medical school.

Graduate School: In order to ensure a smooth transition into the graduate years, the Program Director, Associate Program Director and Assistant Program director meet with the students approximately two months prior to the summer semester to review all the necessary steps to ensure a smooth transition. In addition, the program has quarterly meetings of the trainees in years Med 1 and 2 and Grad 1 and 2, which serves as a very useful vehicle for the students to exchange ideas about their experiences in the transition phases. Similarly, the Grad 3 and 4 students have quarterly meetings with the Med 3 and 4 students. The graduate school curriculum includes several core courses. MSTP students are required to complete the Essentials of Scientific Practice (ESP) course, which consists of three parts. ESP I includes professional development lectures, the responsible conduct of research, interactive workshops, and small group discussions. The content includes authorship, peer review, conflict of interest, proper considerations for human and animal subjects, data collection and management, intellectual property rights, laboratory safety, and scientific misconduct. The course is led by Dr. Edward Krug, Associate Dean for Postdoctoral Affairs and Research Integrity Officer, and includes participation by several other faculty. ESP II is titled “Diversity in Science,” and addresses topics pertaining to underrepresented minority and majority groups in the biomedical sciences. ESP III is a course in grant-writing and other career skills development, in which students write a grant proposal section by section that is critically evaluated by faculty facilitators and the students. In addition, MSTP students are required to complete a course titled “Important Unanswered Questions in the Biomedical Sciences.” Faculty lecturers for this course conduct translational research, either as basic scientists or clinician scientists. Assignments for this
course consist of a two page proposal including background, hypothesis, two specific aims to test the hypothesis, expected results, and alternative outcomes. In addition, students complete a course title “Applied Biostatistics and Experimental Design.”

Once the MSTP student chooses a graduate program, s/he must fulfill the requirements set forth for graduate students in that program. Some programs give credit for some of the medical school courses that the students have taken. Each doctoral program defines its own degree requirements that, while differing in details, have the same guiding principles. All include: (1) a defined set of courses that represent the didactic component of the discipline making up the graduate program; (2) rules guiding the selection of a research mentor and dissertation advisory committee; (3) defined written and oral qualifying exams taken at the end of the second year of study; (4) submission and defense of a plan of research; and (5) submission and defense of a dissertation describing an original piece of research. The student’s defense presentation is evaluated by each member of the committee using a standardized form. The evaluations are collected by the primary mentor and discussed with the student. All the programs include a set of elective courses, selected with input and approval from the student’s mentor, advisory committee and graduate program coordinator. To ensure uniform didactic requirements for all PhD students, the Graduate Council implemented a rule in 2001 that all PhD programs require a minimum of 12 didactic hours beyond the core curriculum or the first two years of medical school. The College has a requirement for demonstrated scientific proficiency in the chosen area of specialty rather than a specific requirement for length of time in a program.

Describe the progress and status of the F30 applicant in relation to the program’s timeline, indicating when the applicant matriculated into the program and when the applicant is likely to transition to clinical years of the dual-degree program.

Describe any clinical tutorials during the graduate research years and any activities to ease transition from the graduate to the clinical years of the dual-degree program.

Several mechanisms serve to provide continuity of clinical training and ease the transition from the graduate to clinical phases of the program. MSTP students are required to volunteer a minimum of two evenings per semester in the CARES clinic, a free evening indigent clinic supervised by MUSC faculty. During the second or third year of the graduate school, students participate for two semesters in the Translational Sciences Clinic, working one half day per week in an outpatient clinic with a clinician scientist chosen for his/her demonstrated commitment to research. They interview patients and discuss findings with the attending and how they relate to findings in the literature and in the physician’s research. This experience creates an environment where students begin to develop an appreciation for the process of translational research and introduces students to mentors who can serve as role models. Before completing their PhD and transitioning into the clinical environment of the third and fourth years of medical school, the students attend a clinical skills workshop with Dr. Donna Kern, an associate professor in the MUSC Department of Family Medicine who plays a major role in MUSC’s clinical curriculum.

The curriculum for the final two years of medical school is composed of clinical rotations. The third year includes six core clinical clerkships (Family Medicine, Internal Medicine, Obstetrics/Gynecology, Pediatrics, Psychiatry, and Surgery). Students complete an NBME subject exam (shelf) at the end of each of these (except for Family Medicine). The third year curriculum also includes four 3-week electives that expose students to other medical specialties and sub-specialties. The fourth year curriculum consists of eight 4-week rotations that include a mandatory one-month externship, a one month surgery rotation, and a one month medicine rotation. The remaining five rotations can take place at any approved institution throughout the country.

Describe any research-associated activities during the clinical years of the dual-degree program.

All MSTP students in their final year of medical school are required to complete the Clinical and Translational Research Center course. During this course, students learn the fundamentals of clinical research through lectures about the various aspects of clinical research and grant writing, by attending meetings of the IRB and working alongside one or more clinical investigators. They also draft an R21 clinical/translational research grant that is a clinical extension of their dissertation research and/or aligned with their future clinical interests.
At the end of the month they present their research proposals to Carol Wagner, MD, Associate Program Director of the CTRC and Professor of Pediatrics, Thomas Hulsey, ScD, Professor of Pediatric Epidemiology and Director of the Masters in Clinical Research (MSCR) program, Dr. Halushka and other members of the CTRC. They also present their proposals to their MSTP colleagues at designated MSTP seminars. They are graded on a pass/fail/honors scale. In addition, all students in their fourth year of medical school collaborate with a clinician-scientist to present a Translational Medicine Seminar. The student presents a clinical case and the investigator discusses the clinical and research aspects of the case.

Describe the frequency and method by which the program formally monitors and evaluates a student’s progress.

Students’ academic progress is continuously monitored. During their graduate years all students are required to meet with their dissertation committee at least once a year, which is strictly enforced by the College of Graduate Studies. At monthly Graduate Council meetings, graduate coordinators are informed if a student has failed to have his/her annual committee meeting and they follow up with the student. The dissertation advisory committee may require an additional meeting in 3 or 6 months if they feel that a student’s progress needs additional assessment. Students are expected to be enrolled until completion of their degree and must successfully defend their dissertation within four years of completing their qualifying examinations. Students must maintain a GPA of 3.0 during the entire time in the program. Students whose GPA falls below 3.0 go on academic probation and have one semester to bring the GPA back up to 3.0 or greater. In addition, the institution has monitoring procedures and a formal policy governing probation and dismissal of students who fail to meet academic standards.

The MSTP Progress Committee also monitors the students’ performance throughout the entire time that they are in the program. The trainees meet with the Program Director and Associate Program director (MSTP progress committee) after the first set of medical school examinations. During the rest of the first two years of medical school, the trainees meet at the end of each semester with the MSTP progress committee. During the graduate years, the trainees meet once a year with the MSTP progress committee to monitor their progress.

Students fill out an individual development plan (IDP) annually with their dissertation advisor (once chosen) or with the program director. The IDP forms a very useful instrument for setting short and long term goals and monitoring progress toward those goals.

This information is typically provided by the director of the dual-degree program or the department chair. The name of the individual providing the information should be included at the end of the attachment.

This information was provided by Perry V. Halushka, PhD, MD, Distinguished University Professor, Dean Emeritus, College of Graduate Studies, Program Director, Medical Scientist Training Program.

Provide justification for the duration of support requested in terms of the research and clinical training proposed. Include the number of anticipated months of research training and of clinical training.
The program announcement associated with this specific fellowship application is PA-05-151; it can be found at http://grants.nih.gov/grants/guide/pa-files/PA-05-151.html

The purpose of the combined M.D./Ph.D. fellowships program is to help ensure that highly trained physician/scientists will be available in adequate numbers and in the appropriate research areas and fields to meet the Nation's research needs in areas relevant to the missions of the participating Institutes. In addition, this mechanism has the potential to train clinical investigators who wish to focus their research endeavors on patient-oriented studies. The applicant must be enrolled in an M.D./Ph.D. program at an approved medical school, accepted in a related scientific Ph.D. program, and supervised by a mentor in that scientific discipline when the application is submitted. The typical applicant will apply during the first year of medical school for funding to begin in the second year; however, applications may be submitted at any stage of medical school. For additional information on this type of award, including additional guidance on review criteria, reviewers are advised to consult the relevant program announcement on the CD-ROM.

The F30 award is similar to the F31 individual predoctoral fellowship in that the purpose is to provide support for research and research training to enhance the fellow's knowledge and skills, and therefore the review of an F30 application should be approached in similar manner to an F31 application. Each major element of the fellowship review (Candidate, Research Training Proposal, Sponsor and Training Environment, and Training Potential) should be commented on in a separate section of your written critique. For revised applications, comment briefly on how the application has addressed the previous critiques and whether the application is improved, the same, or worse. Your review should consist primarily of evaluative statements, avoiding excessive descriptive material (e.g., listing every school attended and every job held by the candidate and/or the sponsor). After considering all of the review criteria, briefly summarize the strengths and weaknesses of the application and recommend an overall level of merit in a section titled Summary and Recommendation (see below).

Please note that your comments will be used essentially unedited in the final summary statement sent to the applicant.

REVIEW AND SELECTION PROCESS

Applications submitted for this funding opportunity will be assigned to the participating ICs on the basis of established PHS referral guidelines.

Appropriate scientific review groups convened in accordance with the standard NIH peer review procedures (http://www.csr.nih.gov/refrev.htm) will evaluate applications for scientific and technical merit.
As part of the initial merit review, applications:

- May undergo a selection process in which only those applications deemed to have the highest scientific merit, generally the top half of application under review, will be discussed and assigned a priority score
- Will receive a written critique
- Will receive a second level of review by appropriate staff within the assigned NIH Institute or Center

The following will be considered in making funding decisions:

- Scientific merit of the proposed project as determined by peer review
- Availability of funds
- Relevance to program priorities

The goal of the F30 individual MD/PhD fellowship program is to train future generations of outstanding physician-scientists committed to pursuing research careers relevant to the missions of the participating NIH Institutes. In their written critiques, reviewers will be asked to comment on each of the following criteria in order to judge the likelihood that the proposed research training will have a substantial impact on the pursuit of this goal. Each of these criteria will be addressed and considered in assigning the overall score, weighting them as appropriate for each application. The scientific review group will use information in the letters of reference in consideration of the review criteria. Note that an application does not need to be strong in all categories to merit a high priority score. The final priority score will reflect the overall evaluation of the entire application.

Review Criteria:
1. Candidate
   - The candidate’s past and current academic and research performance and his/her potential to, and commitment to, becoming an important contributor to biomedical, behavioral or clinical science as a physician-scientist

2. Research Training Proposal
   - The merit of the scientific proposal
   - The quality of the research training plan
   - Potential of the research training plan to provide the fellow with the individualized and supervised experiences that will develop his/her research skills
   - Potential of the proposed research training to serve as a sound foundation that will lead the candidate to a productive research career in scientific areas related to the mission of one of the participating NIH Institutes.

3. Sponsor and Training Environment
   - The qualifications of the sponsor as a mentor, including training track record, and as a researcher, including successful competition for research support;
   - Evidence of an understanding of the applicant's research training needs and a demonstrated ability, on the part of the sponsor, to assist in meeting these needs
   - The quality of the training environment including the institutional commitment to research training of physician-scientists, the quality of the facilities and related resources (e.g. equipment, laboratory space, computer time, subject populations), and the availability of research support

4. Training Potential
   - The value of the proposed fellowship experience as it relates to the candidate’s needs in preparation for a career as an independent researcher and physician-scientist
Additional Review Criteria:
In addition to the above criteria, the following items will continue to be considered in the determination of scientific merit and the priority score:

**Protection of Human Subjects from Research Risk**: The involvement of human subjects and protections from research risk relating to their participation in the proposed research will be assessed (see criteria included in the section on Federal Citations, below).

**Inclusion of Women, Minorities and Children in Research**: The adequacy of plans to include subjects from both genders, all racial and ethnic groups (and subgroups), and children as appropriate for the scientific goals of the research will be assessed. Plans for the recruitment and retention of subjects will also be evaluated (see inclusion criteria in the section on Federal Citations, below).

**Care and Use of Vertebrate Animals in Research**: If vertebrate animals are to be used in the project, the five items described on page 21 of the PHS 416-1 fellowship application instructions (rev. 6/2002) will be assessed.

**Biohazards**: If materials or procedures are proposed that are potentially hazardous to research personnel and/or the environment, determine if the proposed protection is adequate.

Additional Review Considerations

**Responsible Conduct of Research**: Every NRSA fellow must receive instruction in the responsible conduct of research ([http://grants.nih.gov/grants/guide/notice-files/not92-236.html](http://grants.nih.gov/grants/guide/notice-files/not92-236.html)). Applications must include the candidate’s plans for obtaining instruction in the responsible conduct of research, including the rationale, subject matter, appropriateness, format, frequency and duration of instruction. The amount and nature of faculty participation must be described. The plan will be discussed after the overall determination of merit, so that the review panel’s evaluation of the plan will not be a factor in the determination of the priority score. The plan will be judged as acceptable or unacceptable. The acceptability of the plan will be described in an administrative note of the summary statement. Regardless of the priority score, an application with an unacceptable plan will not be funded until the applicant provides a revised acceptable plan. Staff in the NIH awarding component will judge the acceptability of the revised plan.

**Sharing Research Data**
Not applicable

**Sharing Research Resources**
Sharing Model Organisms: For many individual fellowships it is anticipated that plans for sharing model organisms would have already been reported to the NIH by the sponsor in his/her research application. When this has occurred, applicants will indicate so and include the appropriate grant number. However, if the development of a new model organism is anticipated, applicants will include a description of a specific plan for sharing and distributing unique model organism research resources or state appropriate reasons why such sharing is restricted or not possible.

Revised 6/12/2009
<table>
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<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Lecture</th>
<th>Assignment Due</th>
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<td>9/27/2015</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>Follow Moodle Course Directions and Read Six Clinical Scenarios, Translational Science and First Drafts Articles over the weekend found in Moodle Course.</td>
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<td>Monday 9/28/2015</td>
<td>9:00 - 10:00AM</td>
<td>BEB 101</td>
<td>Orientation - Meet and Greet Overview of Course Dr. Carol Wagner</td>
<td>SPARC request handout for Biostats consult how to find on Moodle. Meet with Mentors on project outline &amp; expectations. Read Different Approaches to Research, R21 Examples found in (Moodle), CONSORT website: <a href="http://www.consort-statement.org/">http://www.consort-statement.org/</a> &amp; additional resources site: <a href="http://www.equator-network.org/">http://www.equator-network.org/</a> and Chapters 1-3 from textbook. Enter SPARC request for Biostats consult by today!</td>
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<td></td>
<td>1:30 - 2:30PM</td>
<td>BEB 101</td>
<td>Hypothesis with Aims and RFA / PRA Approach (Find an example) Dr. Carol Wagner</td>
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<td></td>
<td>2:30 - 4:30PM</td>
<td>BEB 101</td>
<td>Review of 5 Clinical Scenarios, Translational Science, and First Drafts Articles Dr. Carol Wagner</td>
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<tr>
<td>Tuesday 9/29/2015</td>
<td>8:30 - 11:30AM</td>
<td>BEB 101</td>
<td>Review CONSORT website, R21 Examples, and R21 Template Dr. Carol Wagner</td>
<td>Read “Informed Consent Articles”, and Read pages 228 - 232 in text. Also review the NIH Bioketch slides</td>
</tr>
<tr>
<td>Wednesday 9/30/2015</td>
<td>9:00AM - Noon</td>
<td>BEB 101</td>
<td>Discuss Specific Aims and Issues Involving Informed Consent Dr. Carol Wagner</td>
<td>Meet with Mentors &amp; work on Project Outline &amp; Expectations</td>
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<td></td>
<td>Noon - 1:00PM</td>
<td>n/a</td>
<td>Break</td>
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<td>1:00 - 3:00PM</td>
<td>BEB 101</td>
<td>Funding Mechanisms / New NIH Biosketch Dr. Joann Sullivan</td>
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<tr>
<td>Thursday 10/1/2015</td>
<td>11:00AM - Noon</td>
<td>BEB 101</td>
<td>Free</td>
<td>Meet with Mentors &amp; work on Project Outline &amp; Expectations. Review Dr. Vena’s power point presentation and assigned reading found on Moodle.</td>
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<td></td>
<td>n/a</td>
<td>n/a</td>
<td>Work with your Mentor</td>
<td>Work with your Mentor. Please upload Specific Aims, Background, and References and any other R21 sections to Bridget TODAY for Power Analysis Consult!</td>
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<tr>
<td>Friday 10/2/2015</td>
<td>Noon - 1:00PM</td>
<td>Class Canceled</td>
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### Monday 10/5/2015

- **10:00 - 11:00AM** Class Canceled

- **Need Rescheduled**
  - CTSA/STR Team Science Initiative’s
  - Dr. Jeff Borckardt

  Read Chapters 4-5 over the weekend and Evidence Based Medicine Articles found on Moodle. Work on Background, References, Approach, Significance and Innovation sections of R21.

### Tuesday 10/6/2015

- **9:30 - 11:00AM** BEB 101
  - Evidence Based Medicine
  - Dr. Jim Kiger

- **12:00 - 1:00PM** HOT Room 601
  - IRB III Meeting

  Review NIH links on potential mechanisms and Regulatory Compliance article, and Brave New Genome article in Moodle. Read Comparative Effectiveness Chapter in text.

### Wednesday 10/7/2015

- **9:30 - 10:30AM** BEB 101
  - Regulatory Compliance / SUCCESS Center Services
  - Katherine Bright and Toni Mauney

- **10:30 - 11:30AM** BEB 101
  - Critiquing Aims & Approach
  - Dr. Carol Wagner

  The Future of Genomic Medicine Interfacing with the Present Day Research Endeavors
  - Dr. Gerald Hardiman

  Refine Approach, References, Significance and Innovation sections of R21.

### Thursday 10/8/2015

- **9:30 - 10:30AM** BEB 101
  - Grants and Budgets
  - Royce Sampson and Steven Skelton

  Review Grant Backgrounds
  - Dr. Carol Wagner

  Refine Approach, References, Significance and Innovation sections of grant proposal. Read "Basic Analysis of Data" and "Issues with Statistics" articles on Moodle. Read Chapters 6-8 and 15 of text.

### Friday 10/9/2015

- **9:30 - 10:30AM** BEB 101
  - Informed Consent
  - Dr. Wagner

- **10:30 - 11:30AM** BEB 101
  - Pharmaceutical Development Overview
  - Dr. Larry Olanoff

  Refine Approach Significance and Innovation sections of grant proposal due today! Biosketch due! Please upload onto Moodle.

- **1:00 - 2:00PM** BEB 101
  - Pilot Grants and Mock Review Directions
  - Dr. Dayan Ranwala
<table>
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<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Session</th>
<th>Notes</th>
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<tr>
<td>Monday 10/12/2015</td>
<td>9:00 to 11:00</td>
<td>BEB 101</td>
<td>Revise Aims &amp; Approach&lt;br&gt;Dr. Carol Wagner</td>
<td>Work on Methods for R21 and Online CCRT&lt;br&gt;YouTube video link - <a href="http://www.youtube.com/watch?v=fBDxI6l4dOA">http://www.youtube.com/watch?v=fBDxI6l4dOA</a></td>
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<td>11:00 - Noon</td>
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<td>Professional Paths&lt;br&gt;Dr. Paula Traktman</td>
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<td>1:00 - 2:00 PM</td>
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<td>Professional Paths&lt;br&gt;Dr. Gary Gilkeson</td>
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<td>Tuesday 10/13/2015</td>
<td>9:00 - 11:00 AM</td>
<td>BEB 201</td>
<td>NIH Mock Review - (YouTube video)&lt;br&gt;Dr. Carol Wagner</td>
<td>Work on written R21 and create your power point presentation.&lt;br&gt;YouTube video type in search box: NIH Peer Review</td>
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<td>Noon - 2:00 PM</td>
<td>HOT 601</td>
<td>IRB III</td>
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<td>2:30 - 3:30 PM</td>
<td>TBA</td>
<td>Mock Presentations</td>
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<td>Wednesday 10/14/2015</td>
<td>9:30 - 10:30 AM</td>
<td>BEB 101</td>
<td>Intellectual Property Protection &amp; Commercialization&lt;br&gt;Dr. Jesse Goodwin</td>
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<td>10:30 - 11:30 AM</td>
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<td>REDCap&lt;br&gt;Stephanie Oppenheimer</td>
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<td>11:30 AM - 12:30 PM</td>
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<td>Health Literacy &amp; Cultural Competency and eIRB Walk Through&lt;br&gt;Dr. Carol Wagner</td>
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<td>1:30 - 3:30 PM</td>
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<td>Mock Presentations</td>
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<td>Thursday 10/15/2015</td>
<td>9:30 AM - 11:00 AM</td>
<td>BEB 101</td>
<td>Negotiating a Work Agreement in Academic Institutions&lt;br&gt;Dr. Gerald Silvestr</td>
<td>Prepare R21 for mock presentation.</td>
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<td>11:00 AM - Noon</td>
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<td>The Perils of the Hunter-gatherer in the Modern Era&lt;br&gt;Dr. John Vena</td>
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<td>Friday 10/16/2015</td>
<td>12:00 - 1:00 PM</td>
<td>CSB 601</td>
<td>How to use the Electronic Health Record as a Data Source and Recruiting Tool&lt;br&gt;Dr. Jim Oates</td>
<td>Prepare for Final Presentation&lt;br&gt;Read Authorship, Misconduct and Writing Scientific Papers articles found on Moodle</td>
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<td>Monday 10/19/2015</td>
<td>9:00 - 10:00AM</td>
<td>BEB 101</td>
<td>Assigning Authorship / Misconduct &amp; Writing Scientific Papers Dr. Carol Wagner</td>
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<td></td>
<td>10:00 - 1:00PM (Lunch Provided)</td>
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<td>Mock R21 Presentations</td>
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<td>Tuesday 10/20/2015</td>
<td>9:00AM - 1:00PM</td>
<td>BEB 101</td>
<td>Final Presentations</td>
<td>Review of Trainees and Fellows R21</td>
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<td>Wednesday 10/21/2015</td>
<td>9:00AM - 1:00PM</td>
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<td>Final Presentations</td>
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<td>Thursday 10/22/2015</td>
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<td>BEB 101</td>
<td>Professional Paths Dr. Perry Halushka</td>
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<td>9:00 - 12:00PM</td>
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<td>Elevator Speech Practice</td>
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<td>Friday 10/23/2015</td>
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<td>Work on written R21, Revise Final Power Point and Online CCRT</td>
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**11/6/2015**

Final written R21, Revised Final Power Point and Online CCRT Due TODAY! Please submit and upload your final power points and written R21s via Moodle

**End of Course**

In the following weeks your proposed R21 will be reviewed. Once your reviews are complete we will share this information with you.

**Room Codes:**

| RMOB 140 Roper Medical Office Building | HOT 601 Harborview Office Tower Room 601 | BEB 101 Bioengineering Building GS Conference Room | BEB 201 Bioengineering Building Room 201 | TBA |
Appendix C

ENTRY INTO 3RD YEAR MEDICINE ROTATIONS

MSTP Student Name: _____________________________________________
Mentor: _______________________________________________________

Experiments Finished

Date Completed  ______

Dissertation Completed & Submitted to Committee

Date Submitted to Committee  ______

Dissertation Committee approved written dissertation

Date Approved by Committee  ______

Tentative Date for the Dissertation Defense  _________________

__________________________  ______________
Student Signature       Date

__________________________  ______________
Mentor Signature       Date

__________________________  ______________
Graduate Coordinator Signature     Date

Upon completion of form, submit to MSTP Program Director

Revised 10/16/15
Medical Scientist Training Program (MSTP)

- MD Year 3
  - 6 clerkships (6 weeks each)
  - 4 selectives (in 2014 - 3-week Ambulatory Clerkship)
  - Translational Sciences MDCOR-871
    - MSTP students completing 2 semesters of clinical experience in this course during the PhD years can apply that toward fulfilling 1 Selective.
    - Does provide clinical experience and career exploration expected of a selective.

Medical Scientist Training Program (MSTP)

- MD Year 4
  - Medicine Core
  - Surgery Core
  - Externship
  - Internship 101
  - 5 Electives
    - 2 electives may be research-focused
    - MED 832: Month in the Research Nexus is required for MD/PhD students and will count as 1 of the 2 allowed research electives in the 4th year.
  - 2 months off for Board Prep and Interviewing
Appendix E

Perspective: Traversing the Bridge Years--Advice for Future Physician-Scientists

Earning two doctorates in a physician-scientist training program is a real accomplishment, but chances are that after graduation you will still be faced with several additional years of training before obtaining your first independent position. This article is about developing a successful strategy to cross the bridge that connects graduation and independence.

The message is about making decisions and asking yourself an important question: How do I want to spend my professional time 10 or more years from now? Ideally, planning should not wait until the summer before residency and postdoc applications are due. In fact, planning should begin soon after you begin the M.D.-Ph.D. program of your choice.

To demystify the path across the bridge, I have divided it into five steps: 1) deciding on your career goals, 2) deciding whether those goals require additional training, 3) deciding which clinical field (if any) best fits your goals and talents, 4) picking your residency (or postdoc) carefully, and 5) thinking like a department chair.

Step 1. Decide where you want to go before you go there.

As far as I know, there are no TV programs about the lives of physician-scientists; most of us who chose this career path did so because we encountered and became enchanted with the idea of integrating medicine and research. Many of us were fortunate to have role models who were "triple threats": successful researchers, doctors, and educators. Our goal was to be like them. The first big step in successfully traversing the bridge is deciding whether that is still your goal--then choosing a bridge that will take you there. Do you still want research and the quest for new knowledge to be the main focus of your career?

This is the question that causes every M.D.-Ph.D. program director to hod his or her breath as we await your answer. We want the answer to be a resounding "Yes!" because it validates our wisdom in selecting you and our success in mentoring you. However, the choice has to be yours, not ours. A research career can be wonderful, but you really have to want it. A recent survey of the alumni of 24 M.D.-Ph.D. programs, conducted by the National Association of M.D.-Ph.D. programs and the Association of American Medical Colleges Section on M.D.-Ph.D. Training, showed that about two-thirds (66%) of the
alumni who had completed all of their training were in academia [1]. Another 14% were working at research institutes or in industry. Most reported spending at least some of their time doing research, but—and this is a critical point—only 65% of those in academia reported devoting at least half of their professional time to research. I would argue that although it is still possible to be a true chimera (physician, scientist, and educator), research has to be the top priority within the mix if it is important to you to succeed as an investigator. Choosing a mix in which a minor fraction of your time is set aside for research usually means that, eventually, you’ll have zero time for research.

What does this have to do with traversing the bridge from M.D.-Ph.D. school to independence? You have to choose the right path as you cross the bridge. If your career goal is to be in academia and do research, then you will need to complete your training as a physician and an investigator so that you can be employed in a setting in which your choices—not those of your department chair—determine your career mix. If you have decided to be a full-time clinician, then your decision is primarily one of picking the clinical field that best fits your talents and interests.

**Step 2: Decide if your goals require more training.**

For most, this is an easy decision. If you plan to practice medicine as even a small part of your career mix, you will need additional medical training, a license, and, in most cases, board certification. In the survey of M.D.-Ph.D. alumni mentioned above, nearly all (98%) chose to complete their clinical training by doing a residency or fellowship. Because nearly all M.D.-Ph.D. program alumni (about 90%) who are in academia have their primary appointment in a clinical department rather than in a basic science department, this makes perfect sense. On the other hand, it makes little sense to spend 3 to 5 years in full-time clinical training as a resident if you don’t intend to use it—or don’t forget that board certifications require regular renewal.

If you do intend to do research later, do you need more research training? Yes. Graduate school for scientists is like medical school for physicians: It’s a great start, but not more than that. Mentored postgraduate research time is when you gain increasing independence, practice the skills you will need to run your own shop, and demonstrate to your future employer that your success as a graduate student wasn’t a fluke.

Furthermore, depending on your interests, the research training you received in graduate school may not be broad enough, or it might not be the right kind. The typical current M.D.-Ph.D. student is training in a biomedical laboratory science. But when program alumni were asked to list the type(s) of research that they do, nearly as many checked the boxes for translational and patient-oriented research as for basic research. They may have done a thesis with a translational focus, but few have received training in the requirements for doing modern patient-oriented research, which includes large doses of epidemiology, statistics, and human-subject trial design.

**Step 3: Decide which clinical field (if any) best fits your career goals and talents.**

If you decide that you wish to do both research and clinical care, then you should carefully consider your answers to the following questions before deciding on a clinical field:

**Will my future department chief truly value research, or will he or she place a higher priority on clinical care?** Some fields and some department chairs have a greater commitment to research than others. Some fields, especially those that are very procedure-oriented, demand considerably more practice time to maintain clinical proficiency. One can be proficient in a subspecialty of internal medicine or pathology with only intermittent clinical service time. It is harder to make the same statement about neurosurgery or any other field dominated by procedures that require constant practice. In theory, one can become a physician-investigator in any clinical field, but the data from the M.D.-Ph.D. survey show that some fields have done a better job of nurturing new investigators than others. It is not hard to find out this information for the fields that intrigue you. When you look around, ask how many of the M.D.-Ph.D. students who entered that field are still physician-
investigators and how many of them ended up in private practice.

Will I have the very large amount of protected time needed to succeed as an investigator? Protected time will remain important throughout your career, but it is absolutely essential when you are getting started. If you are in a clinical department with large service requirements or with a high malpractice insurance rate, pressures on your protected time can quickly become overwhelming. If you intend to be in a clinical department, it is essential to consider its culture and values. In other words, you have to look beyond the glitz and consider what is actually going on.

Have I adequately explored my clinical choices from the faculty perspective and not just the medical student or resident perspective? The usual medical student experiences are unlikely to reveal much about the experience of being a faculty member in a particular field. Consider for a moment the typical physician-scientist attending on a pediatrics service. She may spend 80% of her time in her lab, 10% of her time teaching, and only 10% of her time on an inpatient service. Your contact with her may be limited to attending rounds, and your conversations will probably be about the patients that you share. In other words, you’ll have a partial look at 10% of her professional life and no look at the other 90%. How can you make an important career decision without knowing more?

So take advantage of opportunities to spend extended time—beyond those limited clinical duties—with physician-scientists who work in clinical fields you are considering. Some M.D.-Ph.D. programs offer organized ways to do this, working with you to develop a list of areas that you wish to explore and then pairing you up with physician-scientists who are working in that area. At the University of Pennsylvania Medical School, we call this the Clinical Connections program. In the 6 years we have offered it, I have seen more students approach graduation with a clear choice of what to do next and far fewer with an undigested list of options and a look of desperation. If your program doesn’t offer something similar, talk to your program director about other ways that you can get the career guidance that you need. These experiences will be enormously valuable as you narrow your choices. Don’t wait until you have defended your thesis, returned to medical school, and are weeks away from submitting residency applications. Explore your options while you are in graduate school working on your thesis project.

Step 4: Pick your residency (or postdoc) carefully.

It is hoped that by the time you have reached step #4, you have decided whether you need to do a residency. If you have decided to forgo additional clinical training in favor of a postdoc, seek advice on the best labs in which to train. Start gathering this information well in advance of graduating. It is not unusual for popular labs to book postdocs a year in advance. How well you do as a postdoc will be critical to finding a job afterward. Prospective employers will want to know that you can be productive and successful as a scientist. Your selection of a mentor when you are a postdoc is critical. Seek someone with a strong record of success as an investigator and a mentor. Look for postdoctoral fellowships that are designed to encourage and develop independence and have at least the potential of a permanent position if things go well.

Chances are, however, that you will be heading off to a residency before returning to research as a fellow. If so, here are some points to consider: First, note whether the residency program views the training of future physician-scientists as an important part of its mission. Second, find programs that attract physician-scientists so that you won’t be surrounded solely by future full-time clinicians. They may be terrific people, but their goals are different from yours.

If you intend to be a physician-investigator, one of your goals should be to get back to research as soon as possible. For most residents, it is unrealistic to think you can do meaningful research while working in a hospital 60 hours a week, including night call. But you can connect with the scientific community at the medical center where you are training by attending seminars, talking to investigators, and networking. When available, short-tracking your residency is an option worth considering. Short-tracking in a field like internal medicine (historically the most popular choice for future physician-scientists) means trading off a year of general internal medicine training for more time as a subspecialty fellow. As a future faculty member, your specialty training—not your generalist training—is far more likely to be what you will be doing clinically, so there are compelling reasons to get to it as quickly as possible.

Keep in mind that you don’t have to do a residency and fellowship at the same place. You don’t even necessarily have to do the clinical phase and the research phase of your fellowship at the same place, although you will have to complete all of the clinical requirements for board certification, and those will likely extend through your research years. Pick a clinical/research fellowship that offers access to great investigators and strong specialty training. Be sure to ask at your interviews whether you have the option of doing research with investigators in other departments and divisions. Always remember that your
accomplishments during the research phase of your fellowship will be key to getting the job offer of your dreams.

A question that I hear frequently is whether graduating from an M.D.-Ph.D. program is an advantage when applying to residencies. The answer is an unequivocal, "Yes, but...." Accomplishments always count, but different clinical fields value research potential differently. Even if a department chair is hunting for future physician-scientists for the faculty, residency directors are usually clinicians. They are looking for capable candidates who can thrive as residents, take good care of patients, and not exacerbate the residency director's incipient ulcer. Especially in popular fields, they may use Step 1 of the United States Medical Licensing Examination board scores and grades in core clinical rotations to screen applicants within a large pool. If they look at your publication record at all, they probably won't do it until later in the process.

You have to have done well clinically to impress them. Doing well in research does not necessarily translate to doing equally well in the world of clinical research. Important decisions often have to be made quickly and based upon incomplete information. As mentioned above, some fields offer a physician-scientist track, which goes by many names. If so, view it as a plus but make sure the director of that track doesn't have to argue for admitting you to the residency despite your clinical performance as a 3rd-year medical student!

**Step 5: Think like a department chair.**

One of the really great things about a career as a physician-scientist is that you get paid to do something you love to do. Of course, to do that, someone has to hire you, protect your time for research, give you space, and provide a million-dollar start-up package. The good news is that jobs are likely to be there. (See also "The Job Outlook for Physician-Scientists" [http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2008_12_05/careedit.a0800174].")

The number of individuals emerging from medical schools each year who become physician-scientists (M.D.-Ph.D. or M.D.) has barely been enough to maintain a steady level. Meanwhile, the age of the average physician-scientist continues to rise [2]. The number of people emerging from M.D.-Ph.D. programs per year (500 to 600) is small and shows little sign of increasing. If you divide this number by the number of clinical specialties, it becomes obvious why the competition for young physician-investigators with promise can be so fierce. As previously mentioned, most physician-scientists working in academia have their primary appointment in a clinical department. That is where the growth has been for the past 25 years [3].

So, if the jobs are there, what do you have to do to make sure that you exit the bridge years with an offer or two in your pocket? Think like a department chair. Hiring new tenure-track faculty members is expensive, and, at best, it will be several years before you can recover your costs by bringing in research grants. The people who hire you will want to be as certain as possible that you will succeed. The search committee members will ask themselves: How well did you do as a graduate student? Did you continue to do well when you renetered the lab as a postdoc/fellow? Have you acquired the skills needed to flourish as an independent investigator? Did you select (and complete) interesting projects? Have you published quality manuscripts? Do you write well and can you give a coherent seminar? Did you compete successfully for peer-reviewed training awards, such as the National Institutes of Health F-awards (http://grants1.nih.gov/training/F_files_nrsa.htm) and K-awards (http://grants1.nih.gov/training/careerdevelopmentawards.htm)? Will you arrive at your first faculty position with some grant funding in hand, or will you be starting from scratch?

Consider all of these questions yourself and, if the answers are not reflected in your CV, be prepared to address them in your cover letter and in an interview. Even better, recognize these generic issues as far in advance as possible and make sure that you receive the training and mentoring you need so you'll shine.

This means you should be very thoughtful about the mentor you choose when you reenter research. Does he or she have a track record of success that will create an environment in which you can thrive? Will his or her letter of recommendation carry a lot of weight? Mentors can help to open doors, including doors to job interviews. Ultimately, it will be up to you to succeed by working hard, but first the door has to open.

**Final thoughts**

If you are like most people emerging from an M.D.-Ph.D. program, you will enter the bridge years between graduation and
independence somewhere in your late 20s and depart them in your mid- to late-30s. This is also a period when you may be getting married or starting a family. "Lifestyle" is a word that comes up frequently in conversations about residency choices for physicians, independent of whether they are physician-scientists. Everyone has to decide for themselves how they will balance their professional commitments with the other important parts of their lives.

My advice has always been that any career path that includes keywords such as "scientist" or "physician" is likely to be demanding. Combining them as a physician-scientist is not likely to be less demanding. Physicians in clinical practice can choose to work reduced hours, but current expectations placed on physician-scientists make that hard to do. Ultimately, you have to make the choice of what you will be and how you will do it. My goal as a program director and in this essay is to help you reach your goals and fulfill the dreams you had when you applied to physician-scientist training programs. I wish you the very best of success as you traverse the bridge to what for me remains a wonderful career.

References


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