

**Medical University of South Carolina**  
College of Graduate Studies



Proposed New Program

**Master of Science in Medical Sciences**

May 15, 2014

A handwritten signature in black ink, appearing to read "Mark S. Sothmann", is positioned above a horizontal line.

**Mark S. Sothmann, Interim President and Provost**  
Medical University of South Carolina

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**New Program Summary  
Master of Science in Medical Sciences  
Medical University of South Carolina**

**2. Program Classification**

Program Name:	Master of Science in Medical Sciences
Program Type:	New program
Academic Unit:	College of Graduate Studies
Program Concentration:	Health sciences with medical and dental school tracks
Program Level and Duration:	Master's Degree, One year (three semesters)
Date of Implementation:	Summer 2015
CIP Code:	26.0102
Site:	Medical University of South Carolina
Scholarship Information:	Graduate level - does not qualify for supplemental Palmetto Fellows Scholarship or LIFE Scholarship awards
Delivery Mode:	Face-to-face on MUSC campus with the exception of 1-2 online courses
Number of Credit Hours:	minimum of 33

**3. Institutional Approval**

Approved by MUSC Dean's Council: January 3, 2014  
Approved by MUSC Board of Trustees: February 14, 2014

**4. Purpose**

The Master of Science in Medical Sciences is proposed to give students seeking acceptance into professional schools (e.g., MD and DMD) a structured, intensive program to increase their competitiveness. Each year professional schools must turn away many highly qualified students for a limited number of seats. Many of these students seek to reapply and are interested in pursuing opportunities to become better qualified, either through coursework or preparation for standardized tests. Our goals are that: 1) students successfully completing this program will be well prepared to perform in any health sciences professional program and also will be 2) academically prepared to enter industrial or academic technical positions requiring a biomedical sciences background. In addition, added coursework in clinical trials coordination and biostatistics will offer these students the opportunity to be employed as research/clinical coordinators in doctor's offices, hospital settings, and academia.

**5. Justification**

- a) Need for the program  
1) Student demand

The Master of Science in Medical Sciences is a new program, but was piloted by the successful Certificate Program in Biomedical Sciences offered through the College of Graduate Studies. The first year the certificate program was offered we received 16 applications, all from in-state students seeking admission into medical school. The second year we received 21 applications, 19 of which were from in-state students. This year (year 3) we received 63 applications, 32 of which were from in-state students. The remaining 31 applications came from 16 other states. Therefore, we are seeing a significant increase in demand for this program as its presence becomes more widely known. In addition to a greater number of applicants, we are

seeing an increase in applications from students interested in professions other than medicine, particularly dental school. This year, the third year of the certificate program, we accepted three students interested in pursuing dental school and had applications from a total of 7 students interested in dental medicine. Due to a newly developed website and advertising through mailings and a presence on other websites (the Association of American Medical Colleges (AAMC), for example), we have had many inquiries into the current certificate program in the past few months and anticipate that our applications will continue to increase each year for the next several years.

We recognize that evidence of demand does not necessarily constitute evidence of need. However, the AAMC lists 192 post-baccalaureate premedical programs in the U.S and Puerto Rico on its website under resources for applicants (<https://services.aamc.org/postbac/>). Of these, only two are in South Carolina (the certificate programs at USC in Columbia and MUSC), neither of which is degree granting and therefore ineligible for financial aid. Therefore, South Carolina residents wishing to attend degree-granting programs to improve their credentials for medical school must currently leave the state.

2) Employment Opportunities - National

The program will provide graduates a foundational experience and stronger credentials for applying for and being accepted into graduate medical programs (MD, DMD, etc.). We expect most graduates of this program to matriculate immediately into a healthcare professional terminal degree program. Employment projections from the Bureau of Labor Statistics for 2012-2022 predict that occupations and industries related to healthcare will add the most new jobs during this time frame (BLS News Release December 19, 2013; available at: <http://www.bls.gov/emp/#news>). Predicted job growth for dentists and physicians nationally are presented in the table below (Bureau of Labor Statistics Employment Projections).

While we expect most of our graduates to pursue further education in professional school, others may choose to seek employment. The curriculum coursework in biostatistics and clinical trials coordination will offer these students the opportunity to be employed in a variety of health-related occupations, including as technicians and clinical trial coordinators in academia or industry. The table below also lists some of these occupations and projected employment by occupation nationally.

<b>Bureau of Labor Statistics Predicted Job Growth 2012-2022</b>				
<b>Type of Job</b>	<b>Number employed 2012</b>	<b>Number employed 2022</b>	<b>Percent change</b>	<b>Projected annual job openings</b>
Dentists	125,800	146,400	+16.3	5,120
Physicians and Surgeons	691,400	814,700	+17.8	29,640
Medical and Health Service Managers	315,000	388,000	+23.2	14,999
Biological technicians	80,200	88,300	+10	3,200
Health educators	58,900	70,100	+19	2,660
Medical and clinical laboratory technicians	161,500	209,400	+29.7	9,020

Bureau of Labor Statistics ([http://www.bls.gov/emp/ep\\_table\\_102.htm](http://www.bls.gov/emp/ep_table_102.htm))

3) Employment Opportunities – South Carolina

<b>South Carolina Employment Security Commission</b>				
<b>Type of Job</b>	<b>Number employed 2012</b>	<b>Number employed 2022</b>	<b>Percent change</b>	<b>Projected annual job openings</b>
Dentists	2,070	2400	+16	70
Physicians and Surgeons	14,800	17,464	+18	530
Medical and Health Service Managers	5,000	6,170	+23	240
Biological technicians	430	470	+9	20
Health educators	1,110	1,380	+25	50
Medical and clinical laboratory technicians	860	1050	+22	40

Several databases were queried over the period of April 28-29, 2014 to determine job listings and postings in South Carolina for opportunities relevant to students participating in this program. The results are tabulated below:

<b>Database</b>	<b>Job Title</b>	<b>Number of postings for available jobs in state (4/28-4/29/14)</b>
SCWorks*	Physician	>500
SCWorks	Dentist	77
MUSC human resources**	Faculty jobs for medicine/dental medicine	27
SCWorks	Clinical Research Coordinator	10
SCWorks	Biological Technician	9
MUSC human resources	Program Coordinator I	2

\*SCWorks (<https://jobs.scworks.org>)

\*\*MUSC human resources (<http://academicdepartments.musc.edu/hr/jobs>)

The data above make it clear that there will be ample employment opportunities for our graduates whether they seek immediate employment or proceed on to a terminal degree in medicine or dental medicine.

b) Mission of MUSC

The following is a portion of the mission statement of MUSC (as stated on the website: <http://academicdepartments.musc.edu/president/mission.html>):

“The Medical University of South Carolina (MUSC) is South Carolina’s only comprehensive academic health science center. Our purpose is to preserve and optimize human life in South Carolina and beyond. MUSC provides an interprofessional environment for learning, discovery, and healing through (1) education of healthcare professionals and biomedical scientists, (2) research in the health sciences, and (3) provision of comprehensive healthcare. As a public institution of higher learning, MUSC provides a full range of educational programs in the biomedical sciences and actively engages in community service and outreach.”

The proposed Master of Science in Medical Sciences degree complies fully with the mission of MUSC to educate healthcare professionals. Students participating in this program will be availed of coursework central to that required by healthcare professionals in addition to professional development and shadowing opportunities in healthcare delivery. Finally, given that students interested in medicine and dentistry will be trained together in the College of Graduate Studies, the proposed program will offer them many opportunities for interprofessional collaborations, in keeping with MUSC’s mission.

c) Relationship to other programs at MUSC

The College of Graduate Studies’ research-intensive Master of Science in Biomedical Sciences degree program has been one resource for students seeking additional preparation to apply to professional school. The existing program allows students to concentrate their studies in Microbiology and Immunology, Neurosciences, Biochemistry and Molecular Biology, Cell and Molecular Pharmacology, Pathology and Laboratory Medicine, Regenerative Medicine and Cell Biology, or Public Health Sciences. Although a number of applicants each year enter the master’s program with the goal of pursuing professional school upon graduation, the program as currently structured is not the ideal solution for these students. It entails significant research time, takes 2-3 years to finish, and does not offer the structured, intensive preparation for professional degree programs these students are seeking. The current Certificate in Biomedical Sciences program, which was established to address this issue, will no longer be offered once the Master of Science in Medical Sciences program is inaugurated. In our experience, students who will be interested in the Master of Medical Sciences program are likely to be quite different in their goals and motivation than students seeking longer research-intensive programs.

MUSC also offers a one-year Master of Science in Clinical Research (MSCR) program. The goals of this program are to train individuals to become principal investigators on grants related to clinical research. Most of the students in this program are current faculty and clinicians (with terminal degrees) who enroll part-time over a two-year period to learn grant writing and grant administration skills needed to excel as researchers in academic medicine. Thus, this program targets a different student demographic and has a different purpose than the program that we propose to offer.

d) Other South Carolina programs

The Table below outlines the current offerings in South Carolina for other master’s programs in the sciences:

<b>Current Master’s Programs in South Carolina</b>	
<b>Institution</b>	<b>Program</b>
Clemson University	Multi-year research-intensive MS degrees in Biological Sciences
Clemson University	One-year MS degree in Biological Sciences and Microbiology, targets K-12 teachers, online

College of Charleston	MS degrees focused on environmental studies, teaching and education, and the arts
USC Columbia	Multi-year research-intensive MS degrees in Biological Sciences and Biomedical Sciences
USC Columbia	Master's degree of Library and Information Science
USC Upstate	Proposed Master of Sciences in Health Sciences
Clafin University	MS in Biotechnology, focused in forensics, plant biotechnology and biostatistics
The Citadel	MS programs in computer science and sports science
Winthrop University	MS degrees in Biology, Psychology and Nutrition, not health science focused
Coastal Carolina	MS in marine and environmental studies

e) Overlap with other programs – state and nationwide

1) Overlap with statewide programs

A variety of other schools in South Carolina offer MS degrees in biological/biomedical sciences, however most of these are two-to-three year degree programs requiring a thesis. Clemson University offers a one-year MS degree in Biological Sciences and Microbiology. However, this program is offered online only and is focused on improving the skills of K-12 teachers. The College of Charleston offers MS degrees focused on environmental studies, teaching and education, and the arts, and our proposed program does not duplicate these efforts. USC Columbia offers MS degrees in Biological Sciences and Biomedical Sciences, but again, these are multi-year, research degrees with the exception of their Master of Science in Library and Information Science, which is focused in an area entirely different from our proposed program. USC Upstate has proposed a two-year Master of Science in Health Sciences degree in conjunction with the Edward Via College of Osteopathic Medicine (<http://www.che.sc.gov/MeetingsEvents/ACAPMeetingsandMaterials/ACAPProgramPlanningSummaries.aspx>). While the goals of this program partially overlap with ours (i.e., to create more competitive applicants to professional schools) the structure is different, and it requires a research experience and a thesis and therefore is more comparable to the research-intensive programs already in existence at MUSC and USC Columbia. Clafin University offers a MS in Biotechnology, which is focused in forensics, plant biotechnology, and biostatistics and thus is not similar at all to our proposed program. The Citadel offers MS programs in computer science and sports science, and consequently our proposed program is again very distinct from theirs. Winthrop University offers MS degrees in Biology, Psychology, and Nutrition, which do not have the health sciences focus of our program. Finally, Coastal Carolina offers a MS degree, but it is focused in marine and environmental studies.

Thus, the proposed program would be unique to South Carolina in offering a one-year master's program with intensive course study and preparation for careers in the health professions. As mentioned above, we believe students seeking entry into the proposed program will be a different demographic from students seeking to enroll in research-intensive, longer master's programs. The co-directors of the proposed program, Drs. Wright and Kasman, in their respective roles as chairs of the College of Graduate Studies PhD and combined research master's admissions committees, counsel many students seeking entry into graduate programs. In our experience, students seeking the research-intensive programs are undecided about whether they wish to attend medical school, apply to a PhD program, or attain the research

skills required to work as lab managers and research technicians in academia or industry. Students seeking the current Certificate Program in Biomedical Sciences have been definitive about their goals of attending professional school and do not desire to enroll in the research-intensive master's programs. Thus, this year even though we saw a tripling of numbers of applicants to our certificate program, there has been no reduction of applicants for our research master's program from 2013 to 2014.

2) Overlap with national programs

While a one-year master's degree offering a broad based health sciences curriculum may be unique to South Carolina, it is not unique nationally. The Association of American Medical Colleges website mentioned above (<https://services.aamc.org/postbac/>) lists 192 programs nationally offering master's or certificate programs to help increase the competitiveness of students who are seeking entry into medical school and already have a baccalaureate degree. The schools offering master's programs are excerpted from this listing and presented in the Table below. In addition, the average full-time enrollment period is included in the table and demonstrates that the majority of these programs take place over two semesters to one year. Schools that are members of the Southern Regional Education Board are indicated with an asterisk.

<b>Program</b>	<b>State</b>	<b>Private/Public</b>	<b>Average Enrollment Time</b>
<u>*University of South Florida Morsani College of Medicine: Masters in Medical Science with a concentration in Interdisciplinary Medical Science (IMS)</u>	FL	Public Institution	11 months
<u>*LSU Shreveport: Master of Science in Biological Sciences with Health Sciences Concentration</u>	LA	Public Institution	12 months
<u>Mississippi College: Masters of Medical Sciences</u>	MS	Private Institution	12 months
<u>Temple University School of Medicine: Advanced Core in Medical Science Post Baccalaureate PreMedical Program</u>	PA	Private Institution	10 months
<u>University of Colorado Anschutz Medical Campus: Master of Science in Modern Human Anatomy</u>	CO	Public Institution	18 months
<u>*University of South Florida: One-year Master of Science in Medical Sciences</u>	FL	Public Institution	12 months
<u>Montana State University: Master of Science in Health Science</u>	MT	Public Institution	12 months
<u>Loyola University Chicago: Master of Arts in Medical Sciences</u>	IL	Private Institution	9 months
<u>Case Western Reserve University: Master of Science in Medical Physiology</u>	OH	Private Institution	14 months
<u>Case Western Reserve University: Master of Science in Applied Anatomy</u>	OH	Private Institution	24 months
<u>University of Michigan Medical School: M.S. Program in Physiology</u>	MI	Public Institution	12 months
<u>Georgetown University: Special Master's Program</u>	DC	Private Institution	11 months
<u>Regis University: Master of Science in Biomedical Sciences</u>	CO	Private Institution	9 months
<u>Hampton University: Medical Science Masters Program</u>	VA	Private Institution	24 months

<u>Lincoln Memorial University: Master of Science degree with majors relevant to medical education</u>	TN	Private Institution	12 months
<u>Tulane University School of Medicine: One-Year Masters Program in Biochemistry &amp; Molecular Biology</u>	LA	Public Institution	12 months
<u>Eastern Mennonite University: MA in Biomedicine</u>	VA	Private Institution	20 months
<u>Drexel University College of Medicine: Master of Biological Science (MBS) Program</u>	PA	Private Institution	24 months
<u>Drexel University College of Medicine: Master of Interdisciplinary Health Sciences (MIHS) Program</u>	PA	Private Institution	24 months
<u>Case Western Reserve University: Masters of Science in Pathology</u>	OH	Private Institution	13months-4 semesters
<u>Loyola University Chicago: Master of Science in Physiology</u>	IL	Private Institution	9 months
<u>Kent State University: College of Public Health, Master of Public Health</u>	OH	Public Institution	24 months
<u>University of Northern Colorado: Master's in Biomedical Science</u>	CO	Public Institution	9 months
<u>*Georgetown University and George Mason University: MS Biomedical Sciences with emphasis in Systems Biology</u>	VA	Public Institution	11 months
<u>UMDNJ-Graduate School of Biomedical Sciences at NJ Medical School: Masters in Biomedical Sciences</u>	NJ	Public Institution	9 months
<u>Tulane University School of Medicine: One Year Masters in Pharmacology Program</u>	LA	Private Institution	11 months
<u>University of Cincinnati College of Medicine: Special Master's Program in Physiology</u>	OH	Public Institution	11 months
<u>*Texas Tech University Health Sciences Center: Pre-Medical Sciences, M.S. in Biomedical Sciences</u>	TX	Public Institution	20 months
<u>William Carey University College of Osteopathic Medicine: Master of Biomedical Science</u>	MS	Private Institution	10 months
<u>University of Wisconsin-Madison</u>	WI		18 months
<u>Syracuse University: M.S. in Biomedical Forensic Sciences</u>	NY	Private Institution	16 months
<u>Temple University School of Medicine</u>	PA	Private Institution	12 months
<u>Tufts University School of Medicine: MS in Biomedical Sciences</u>	MA	Private Institution	12 months
<u>UCSF: Masters of Science in Biomedical Imaging (MSBI) Graduate Program</u>	CA	Public Institution	12 months
<u>University of Wisconsin-Madison</u>	WI	Public Institution	12 months
<u>*University of North Texas Health Science Center : Biomedical Science Graduate Program</u>	TX	Public Institution	12 months
<u>Drexel University College of Medicine: Master of Medical Science</u>	PA	Private Institution	24 months
<u>Case Western Reserve University: MS in Medical Physiology</u>	OH	Private Institution	16 months
<u>Indiana University School of Medicine: Master of Science in Medical Science</u>	IN	Public Institution	24 months
<u>Arizona State University: Master of Science in the Science of</u>	AZ	Public Institution	9 months

Healthcare Delivery

<u>North Carolina State University : Physiology Graduate Program</u>	NC	Public Institution	24 months
<u>Chatham University: Master of Science in Biology, Non-Thesis</u>	PA	Private Institution	12 months
<u>Tulane University School of Medicine: One-Year Masters Program in Microbiology and Immunology</u>	LA	Private Institution	12 months
<u>Lipscomb University : Master of Science in Biomolecular Science</u>	TN	Private Institution	12 months
<u>Marian University College of Osteopathic Medicine: Biomedical Sciences Program</u>	IN	Private Institution	10 months
<u>Larkin Health Sciences Institute: Masters of Science in Biomedical Sciences</u>	FL	Private Institution	24 months
<u>Liberty University School of Health Sciences: Master of Science in Biomedical Sciences</u>	VA	Private Institution	12 months
<u>*University of Mississippi Medical Center: Master's of Science in Biomedical Sciences</u>	MS	Public Institution	10 months
<u>Johns Hopkins University: Master of Health Science, Biochemistry and Molecular Biology, Bloomberg School of Public Health</u>	MD	Private Institution	9 months
<u>*University of Maryland</u>	MD	Public Institution	21 months (part time)
<u>The Commonwealth Medical College (TCMC): Master of Biomedical Sciences</u>	PA		12 months
<u>Loyola University Chicago: Master of Arts in Medical Sciences</u>	IL	Private Institution	9 months
<u>Assumption College</u>	MA	Private Institution	
<u>University of Southern Maine: Department of Biology</u>	ME	Public Institution	24 months
<u>Philadelphia College of Osteopathic Medicine: Biomedical Sciences Program</u>	PA	Private Institution	24 months
<u>Tulane University School of Medicine: Masters degree in Human Genetics - Hayward Genetics Center</u>	LA	Private Institution	10 months
<u>University of Toledo - Health Science Campus: MSBS in Medical Sciences</u>	OH	Public Institution	12 months
<u>Georgetown University: MS Physiology &amp; Biophysics - Complementary &amp; Alternative Medicine (CAM) Program</u>	DC	Private Institution	11 months
<u>Midwestern University: Master of Arts in Biomedical Science</u>	AZ	Private Institution	10 months
<u>Colorado State University: Master of Science in Biomedical Sciences (1 year)</u>	CO	Public Institution	12 months
<u>Rosalind Franklin University of Medicine &amp; Science: Master of Science in Biomedical Sciences</u>	IL	Private Institution	10 months
<u>Tulane University: Cell and Molecular Biology One Year Masters</u>	LA	Private Institution	10 months
<u>Northwestern University: Program in Public Health</u>	IL	Private Institution	12 months
<u>Western University of Health Sciences</u>	CA	Private Institution	11 months
<u>The Commonwealth Medical College: Master's of Biomedical Science</u>	PA	Private Institution	10 months

<u>Eastern Virginia Medical School: Medical Masters Program</u>	VA	Public Institution	10 months
<u>Barry University: Biomedical Sciences</u>	FL	Private Institution	22 months
<u>Boston University School of Medicine: Master of Arts in Medical Sciences Program</u>	MA	Private Institution	16 months
<u>New York Medical College: Basic Medical Sciences Interdisciplinary Program Traditional Track</u>	NY	Private Institution	21 months
<u>Dartmouth Medical School: The Dartmouth Institute for Health Policy and Clinical Practice</u>	NH	Private Institution	11 months
<u>Columbia University Medical Center: Institute of Human Nutrition</u>	NY	Private Institution	11 months

Therefore, there are numerous programs nationally that have very similar goals and structure as our proposed Master of Science in Medical Sciences. However, we are uniquely positioned in the coastal region encompassing North Florida to Virginia to offer a program of this type. As described above, we are seeing a great deal of interest from students seeking to apply to our current certificate program.

## **6. Admissions criteria**

All applicants must have completed a baccalaureate degree and must submit a recent (within 2 years) test score for their target profession (MCAT/DAT/GRE), transcripts from all undergraduate institutions attended, personal statement regarding their determination to attend professional school, resume, and three letters of reference. Applicants who have previously applied to professional schools may substitute that application (e.g. AMCAS) instead.

Admissions criteria for this program are set such that an individual who successfully completes all requirements for the Master of Science in Medical Sciences will have an excellent chance of being admitted to a professional school in their field of choice. Specifically, competitive applicants to the proposed program will have obtained the following:

- Undergraduate grade point average at or above 3.0 Coursework should be consistent with that required by their professional school of choice.
- National admissions test score at or above the 40<sup>th</sup> percentile. Currently:
  - MCAT at or above 24
  - DAT at or above 17/18
  - GRE at or above 300

Applicants without these credentials are unlikely to be competitive for professional school even with an MS in Medical Sciences credential. Exceptions may be made for applicants with unusual characteristics that provide added value in their application, such as current employment as a healthcare provider, significant research experiences, a documented underrepresented or disadvantaged background, or fluency in two or more languages.

## **7. Enrollment**

Assumptions for Table A- Total Projected Enrollment:

1. the program is a one year (3 semester) program
2. new students are required to start in the summer semester
3. all enrollees will be new to MUSC each year
4. all students will take a minimum of 11 credit hours per semester (minimum required)
5. there will be some attrition between the last two (fall and spring) semesters
6. half the students will take an elective (4 credits) in the fall and spring semesters

PROJECTED TOTAL ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit hours	Headcount	Credit hours	Headcount	Credit hours
2015-16	18	234	16	208	18	198
2016-17	18	234	16	208	18	198
2017-18	18	234	16	208	18	198
2018-19	18	234	16	208	18	198
2019-20	18	234	16	208	18	198

## 8. Curriculum

The proposed curriculum for the Master of Science in Medical Sciences will require a minimum of 33 credit hours over three consecutive semesters and does not require a thesis. The curriculum is outlined in the following table:

Summer Semester (10 weeks)	Fall Semester (15 weeks)	Spring Semester (15 weeks)
BSC 700 Online Histology (Ogilvie/Sawyer) 4 credits	BSC 712 Biochemistry (Palanisamy) 3 credits	BSC 714 Oral Immunobiology (Westwater) 4 credits
BSC 704 standardized test preparation (Wright/ Kasman/ student SIs) 3 credits	BSC 702 Anatomy (Bacro) 4 credits	BSC 716 Clinical Microbiology (Schmidt/Kasman) 4 credits
BSC 706 Professional Development (Wright/Kasman) 1 credit	CGS 700 Biostatistics (Martin) 4 credits	MSCR 724 Introduction to Clinical Trials (King) 3 credits
BSC 708 Grand Rounds (Halushka) 1 credit		
CCRT Core Clinical Research Training (online or classroom, offered several times per year) 2 credits	Electives	Electives
Total of 11 credits	Total of 11-15 credits	Total of 11-15 credits

With the exception of histology, all courses are taught face-to-face on the MUSC campus. The CCRT is a course offered several times per year through our South Carolina Clinical and Translational Research Institute (SCTR) and offers training in clinical trials ethics, research misconduct, and informed consent procedures. BSC courses 704, 706, 708 and 702 were developed specifically for this program and contain only the students in this program, giving them intensive time with the course instructors. BSC 704 offers tutoring and preparation for taking the MCAT and DAT. Most students in our current certificate program have raised their standardized test scores on retaking the exam, with one student increasing his MCAT score by 8 points. Professional development offers workshops on writing personal statements, stress and time management, writing CVs, and has visiting speakers who address national trends in healthcare, and financing the cost of professional school. In Grand Rounds students are expected to attend one grand rounds presentation per week on the MUSC campus and to write a paper describing the topic of the presentation. This provides them with practice in writing as well as exposing them to numerous and diverse issues in contemporary medicine, including dental medicine.

BSC 712, 716 and 714 are sections of courses offered to MUSC's dental students and the Master of Science in Medical Sciences students will take the courses alongside the dental students. This offers them the unique opportunity to interact with other health professions students and to experience the coursework similarly to how it will be offered once they enter a professional school program. Students interested in dental school will be required to re-take these courses as part of the dental school curriculum if they matriculate to MUSC. The rationale for retaking the courses is to place the material in the context of the entire dental school curriculum, and to allow faculty to assess the students' progress relative to the entire class. Also, if the students did not re-take the coursework there would be a three-year gap between the coursework and their national board exams, potentially having a negative effect on the students' performance. We expect this coursework to prepare students interested in medical school to be more fully prepared for their future coursework, but the courses will not substitute (at least at MUSC) for the coursework in medical school.

The coursework for the proposed program is essentially identical to the coursework already established for the Certificate Program in Biomedical Sciences program with the exception of added coursework in clinical trials and biostatistics. These courses were added to give participating students additional employment opportunities should they not seek to enter professional school at the end of the year. In addition, this coursework is valuable to physicians and dentists in academic settings and in understanding the process of working with patients who enroll in clinical trials.

Additional elective courses are available. Suitable electives include PCOL 625 (Physiology), HAP 635 (The Language of Medicine), HAP 704 (Health Policy), PROS 901 (Introduction to Dentistry – for students entering dental programs), IP 704 (Smiles for Life), and IP 732 (History of Health Sciences), CGS 710 (Essentials of Scientific Practice), CGS 711 (Diversity in Science), and a clinical experience called A Month in the Research Nexus where students would get hands-on experience in running and developing clinical research projects.

To receive the MS in Medical Sciences degree, the student must be enrolled as a full-time student (minimum of 11 credits per session), submit a portfolio at the end of fall semester (consisting of their CV, personal statement, and two Grand Rounds reports), pass all honors-pass-fail courses, and finish with a cumulative minimum grade point average of 3.0 in the required merit graded courses.

## 9. Assessment

The mission of the Master of Science in Medical Sciences program is to develop students who are strong candidates for acceptance into a graduate health professions program. In addition, graduates will have advanced knowledge of foundations of human health and disease, thus preparing them for careers in health sciences should they not enter a graduate health sciences degree program. The effectiveness of the degree program will be assessed through both program outcomes and student learning outcomes, with data collected and reviewed annually, as described below.

### **Program Outcome: The program prepares students for a future career in health sciences**

Measured by [Target % of students]

- Percent of graduates that apply that are accepted within one year of graduation into a professional healthcare program [80%]
- Percent of students who agree/strongly agree that they received a high quality education in the program (from exit interview) [90%]
- Percent of students who graduate within one year of program entry [95%]

Note: While we realize that there may be some attrition for our program, we have set a rigorous target of 95% of students will complete the program in one year. Reasons that students do not complete the program will be determined by exit interview, allowing us to measure and track reasons for less than ideal outcomes and perform program improvements.

### **Student Learning Outcome 1: Graduates will exhibit the professionalism required of medical/dental/allied healthcare students**

Measured by [Target % of students]

- Organization of student portfolio contents (see below) meets or exceeds expectations, based on a standardized rubric [95%]
- Clarity of student portfolio contents meets or exceeds expectations, based on a standardized rubric [95%]
- Completeness of student portfolio contents meets or exceeds expectations, based on a standardized rubric [95%]
- Percent of graduates that apply that are accepted within one year of graduation into a professional healthcare program [80%]

Note: Professionalism outcomes for each student will be evaluated through their performance portfolio that will include submission of two written evaluations of grand rounds attended, a CV, and a personal statement for application to medical / dental /allied health school. These materials will be evaluated by the program directors for organization, clarity, and completeness using a standardized scoring rubric to determine whether the portfolio meets/does not meet expectations.

### **Student Learning Outcome 2: Graduates will understand fundamental concepts in cell biology and disease processes**

- Performance on test of histology knowledge meets or exceed expectations based on specific criteria communicated to the student at the start of the course [90%]
- Performance on test of anatomy knowledge meets or exceed expectations based on specific criteria communicated to the student at the start of the course [90%]
- Performance on test of biochemistry knowledge meets or exceed expectations based on specific criteria communicated to the student at the start of the course [90%]

Use of data to make improvements: Review of Program Outcomes and Student Learning Outcomes will be conducted annually. These results are stored centrally in MUSC's Office of Institutional Effectiveness. Results are examined annually and assessments will remain constant for at least three years to afford trend analysis. Per university policy, at least every three years, academic program faculty meet to examine trends in program outcomes and student learning outcomes to determine appropriate modifications to be made to improve outcomes.

## 10. Faculty

**Table B: Faculty list for required courses**

Rank	Highest degree earned	Field of Study	Teaching in Field (Yes/No)
Professor#1	PhD	Microbiology and Immunology	Yes
Professor#2	PhD	Education	Yes
Professor#3	PhD	Cell Biology and Anatomy	Yes
Professor#4	PhD	Developmental Biology and Anatomy	Yes
Professor#5	MD, PhD	Pharmacology and Medicine	Yes
Professor#6	PhD	Biochemistry	Yes
Associate Professor #1	PhD	Cell Biology and Anatomy	Yes
Associate Professor #2	PhD	Microbiology and Immunology	Yes
Associate Professor #3	PhD	Microbiology and Immunology	Yes
Associate Professor #4	PhD	Microbiology and Immunology	Yes/No*
Associate Professor #5	PhD	Biochemistry	Yes
Assistant Professor #1	PhD, DMD	Molecular Biochemistry and Dentistry	Yes
Assistant Professor #2	PhD	Biochemistry	Yes
Assistant Professor #3	PhD	Public Health Sciences /Biostatistics	Yes
Clinical Instructor#1	M.S.W.	Psychiatry and Behavioral Sciences	Yes

\*No formal training in standardized test prep or professional development coaching.

b) Enumeration and qualifications for new faculty. No new faculty will be hired specifically for this program. All current faculty listed above and all future faculty will have been hired to full time MUSC faculty positions, hold terminal degrees in their field, and be expected to fulfill multiple responsibilities. As for all faculty positions, hiring process at MUSC is the responsibility of individual departments, with final offers subject to approval by the Dean of each college. One part-time (25% FTE) Program Coordinator position will be added to provide office support for this program. The individual for this support staff position will be required to have entry level qualifications for an administrative assistant.

c) No anticipated new faculty positions. As stated above, all proposed faculty for this program are currently employed by MUSC. The majority of credit hours required for this program consist of courses also taught to dental students, and therefore any additional teaching load is only that

associated with having 16-18 more students in a classroom that formerly had 70-80 students. Online courses (BSC 700 and Core Clinical Research Training), MSCR 724, and all electives are likewise offered regardless of enrollment of MS in Medical Science students. The pass-fail-honors courses are team taught and require only 2-3 hours annually of individual faculty time. Only BSC 700 (Biostatistics) and 702 (Anatomy) consist of classroom time exclusively for the MS in Medical Science students. However, these courses are nearly identical in content to other courses taught by the respective faculty, and therefore the additional faculty time consists mostly of 4 hrs of classroom face-to-face time per week. Therefore, no reassignments or additional positions are anticipated for implementation of this program at MUSC.

d) Faculty development. Faculty members who are part of the MS in Medical Sciences program will have numerous excellent opportunities to learn methods of teaching instruction and teaching design at MUSC. The MUSC Center for Academic Excellence, which is directed by full-time education professionals, provides one-on-one teaching improvement consultations for lecturing, small group facilitation, or online teaching for faculty members. They also offer feedback on teaching materials including teaching for multiple learning styles and assist with syllabi development for promotion of critical thinking, active learning, and test construction. These written materials provide guidance in constructive feedback and strategies for helping students study effectively. During the academic year, education professionals from the Center for Academic Excellence provide assessment and evaluation of lectures given by faculty.

Faculty development sessions to assist faculty with improvements of their teaching are provided in two additional ways. The college of Graduate Studies offers a course called Teaching Techniques (CGS 725) that is focused on helping participants learn the foundations of pedagogy. In addition, there are sessions held by the MUSC Apple Tree Society, which hosts seminars at least monthly that are open to faculty, staff and students. During the 2010-2011 academic year, 20 sessions were offered which focused primarily on the effective use of technology in the classroom. All faculty development sessions are also recorded and posted on the Apple Tree Website for easy access by faculty who are unable to attend. Some departments also send their course directors to annual or bi-annual national and regional society meetings and workshops for educators. All course directors and instructors in the curriculum will receive student feedback on their teaching, in both numerical and narrative form. These reports are also sent to their department Chairs.

All full-time faculty members at MUSC are expected to publish in scholarly journals. Appointment and promotion in all faculty tracks require authorship contribution on a minimum number of refereed publications. Annual faculty contracts include a statement regarding percent effort protected for scholarship, the amount of which is negotiated at the department level between the faculty member and his or her Chair each year. The Deans have formalized mentoring as one of the strategic goals of the university, and all Chairs have developed mentoring plans for their departments. For a copy of each department's mentoring plan visit [http://academicdepartments.musc.edu/com/faculty/dept\\_mentoring.htm](http://academicdepartments.musc.edu/com/faculty/dept_mentoring.htm)

At the institutional level, there are a number of resources that support clinical, educational, translational, and basic science research. These are advertised on the MUSC Research and Discovery website and include the Office of Research Development which identifies funding opportunities, develops proposal concepts, networks faculty members with complementary interests, provides grant-writing consultation and workshops, offers pre-submission critiques, compiles institutional data, and prepares competitive proposals for research resources and research training. Evidence of the success of support for faculty research is the fact that MUSC set a new record in 2010-2011 for total grant support from outside sources of \$238 million.

e) The institutional definition of FTE (full-time equivalent) is a position authorized by the state reflecting a percentage of effort.

f) Table C- Unit Administration, faculty and staff support table.

<b>UNIT ADMINISTRATION, FACULTY, AND STAFF SUPPORT</b>						
<b>YEAR</b>	<b>NEW</b>		<b>EXISTING</b>		<b>TOTAL</b>	
<b>Administration</b>						
	Headcount	FTE	Headcount	FTE	Headcount	FTE
2015-16	0	0	2	0.2	2	0.2
2016-17	0	0	2	0.2	2	0.2
2017-18	0	0	2	0.2	2	0.2
2018-19	0	0	2	0.2	2	0.2
2019-20	0	0	2	0.2	2	0.2
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0.2</b>	<b>2</b>	<b>0.2</b>
<b>Faculty</b>						
2015-16	0	0	15	0.75	15	0.75
2016-17	0	0	15	0.75	15	0.75
2017-18	0	0	15	0.75	15	0.75
2018-19	0	0	15	0.75	15	0.75
2019-20	0	0	15	0.75	15	0.75
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>0.75</b>	<b>15</b>	<b>0.75</b>
<b>Staff</b>						
2015-16	1	0.25	0	0	1	0.25
2016-17	0	0	1	0.25	1	0.25
2017-18	0	0	1	0.25	1	0.25
2018-19	0	0	1	0.25	1	0.25
2019-20	0	0	1	0.25	1	0.25
<b>TOTAL</b>	<b>1</b>	<b>0.25</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0.25</b>

\*15 faculty at 0.05 FTE per individual = 15 x 0.05 = 0.75 FTE

## 11. Physical Plant

Annual enrollment in this program is estimated at about 18 students/year, which is small given the total annual enrollment in the College of Graduate Studies at MUSC. Current classrooms and facilities in the Basic Sciences, Library, and Bioengineering Buildings have been adequate for the Certificate Program in Biomedical Sciences and will continue to be adequate for the proposed master's program. Classrooms at MUSC are equipped with state-of-the-art computers, projection equipment, recording equipment, microphones, etc.

## 12. Equipment

No new equipment is anticipated for this program.

### **13. Library Resources**

Current library resources at MUSC are adequate to support the program. The MUSC Library serves as a database and knowledge center, academic computing support unit, electronic education center, and leader in information planning. Online resources include major biomedical databases (e.g., Scopus, CINAHL, PsycINFO, SciFinder Web, and PubMed). Resources include drug information (Lexicomp Online, the Electronic Orange Book), consumer health (Hands on Health, MedlinePlus, Health Reference Center), clinical decision support systems (DynaMed, UpToDate, DDX), Clinical Practice Guidelines, clinical trials, evidence-based practice (Cochrane, the TRIP database), government resources (Toxnet, Federal Register, Code of Federal Regulations, SC and US Statistical Abstracts), the Computational Biology Resource Center, over 30,000 electronic books (Procedures Consult, Harrison's Online, AccessMedicine) and e-journal packages with over 19,000 individual journals), statewide shared academic databases (Collegiate DISCUS, DISCUS), and other resources that provide a wealth of global information. Service-oriented faculty and staff assist in the use of a variety of informational systems. An active program of individual, class, and group instruction supports teaching, clinical care, research and community outreach. The Library includes the Instructional Technology Lab for web-based instruction and curriculum evaluation, and the Informatics Lab with more than 180 microcomputers and peripheral equipment. In addition to off-campus remote access to collections and information, the Library maintains 250 print journals that are not available electronically. The library serves as a resource library within the National Network of Libraries of Medicine, and is a major health science resource library for the State and the Southeast.

### **14. Accreditation, Approval, Licensure, or Certification**

Not applicable for this program.

### **15. Articulation**

The proposed program leads to a master's degree and, as such, is not a terminal degree. MUSC participates in the South Carolina Transfer and Articulation (SC TRAC) program but does not offer general education courses and students rarely transfer in or out of our graduate degree programs.

(<http://www.sctrac.org/MedicalUniversityofSouthCarolina/TransferProfile/tabid/476/Default.aspx>).

### **16. Estimate of Costs and Sources of Financing**

The proposed program costs will be similar to the current costs for the Certificate of Biomedical Sciences program. Therefore, most of the necessary faculty and staff are in place and the program will not incur any unique costs or special state appropriations. Tuition will be the primary source of funding. However, the program will incur additional costs over current costs of the certificate program to offer the Biostatistics course at approximately \$7,000 (taking into account credit hours and %FTE needed for teaching), and will need additional administrative staff to accommodate the increased student load at an estimated cost of \$9,500 for 25% effort for a Program Coordinator. This person will be responsible for advertising the program, collating applications, correspondence with applicants, orientation, registration, general paperwork, and program evaluation.

In Table D we estimate that there will be 18 students/year participating in the program and that 5 of them will be out of state (based on the number of out of state students enrolled in

year 3 of the current Certificate in Biomedical Sciences Program). Tuition income is based on 2014-2015 numbers published on the MUSC website ([http://academicdepartments.musc.edu/esl/em/records/fees\\_14.html](http://academicdepartments.musc.edu/esl/em/records/fees_14.html)).

<b>Table D- Estimated Costs by Year</b>						
<b>Category</b>	<b>1<sup>st</sup></b>	<b>2<sup>nd</sup></b>	<b>3<sup>rd</sup></b>	<b>4<sup>th</sup></b>	<b>5<sup>th</sup></b>	<b>TOTALS</b>
Program Administration*	22,585	22,585	22,585	22,585	22,585	112,925
Faculty Salaries**	74,756	74,756	74,756	74,756	74,756	373,780
Graduate Assistants	0	0	0	0	0	0
Clerical/Support Personnel	9,500	9,500	9,500	9,500	9,500	47,500
Supplies and Materials***	700	700	700	700	700	3,500
Library Resources	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
Other (Identify)	0	0	0	0	0	0
<b>TOTALS</b>	<b>107,541</b>	<b>107,541</b>	<b>107,541</b>	<b>107,541</b>	<b>107,541</b>	<b>537,705</b>
<b>Sources of Financing by Year</b>						
Tuition Funding	377,745	377,745	377,745	377,745	377,745	1,888,725
Program-Specific Fees	56,898	56,898	56,898	56,898	56,898	284,490
State Funding	0	0	0	0	0	0
Reallocation of Funds	0	0	0	0	0	0
Federal Funding	0	0	0	0	0	0
Other Funding (Specify)	0	0	0	0	0	0
<b>TOTALS</b>	<b>434,643</b>	<b>434,643</b>	<b>434,643</b>	<b>434,643</b>	<b>434,643</b>	<b>2,173,215</b>

\* Program administration based on %FTE for program directors

\*\*Faculty salaries based on number of students matriculating and credit hours for courses taught

\*\*\*Supplies and materials based on costs of standardized test preparation materials for students and advertising costs