Duke University School of Medicine

Proposal for a Master of Biomedical Sciences

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The Duke University School of Medicine (SOM) proposes an innovative one-year professional master's degree, which integrates graduate level human biological sciences with skill development in critical thinking, communication and teamwork. The degree will enhance the scientific and professional preparation of students aspiring to **a career in the health professions or in a related field requiring graduate level biomedical sciences.** This will be accomplished by providing a combination of multidisciplinary graduate level coursework, immersive patient-centered service learning, individualized electives, advising, and professional development. The curriculum design is grounded in an extensive body of literature that defines the state of the art in both substance and pedagogy in health professions education.

The Faculty are committed to extending intellectual development beyond the narrow, traditional definitions of scholarship that are limited to discovery, to Ernest L. Boyer's expanded typology that includes the scholarship of integration, the scholarship of application, and the scholarship of teaching. This will be evident through innovations in pedagogy and interdisciplinary curricula.

The Program leadership is committed to demonstrating value and respect for our students and their resources, and to minimizing students' potential debt burden. We will do this by keeping tuition and fees well within the range charged by other pre-professional programs; by dedicating at least fifteen percent of annual tuition revenue to scholarships; by including financial planning (including debt management) in the professional skills curriculum; by seeking additional philanthropic support, especially for students historically underrepresented in the health professions; and by cultivating employment opportunities for our graduates through deliberate outreach to business, industry, and non-profit entities.

Students who complete the prescribed course of study will be awarded a Master of Biomedical Sciences (MBS) degree by the School of Medicine.

Substantive Change Checklist

SUBSTANTIVE CHANGE CHECKLIST

INTRODUCTION

Substantive change is a federal term pertaining to any "significant modification of the nature and scope of an accredited institution." Colleges and Universities must notify their accrediting body of potential or actual substantive change in a timely fashion, and in many cases must receive approval for such change from the accrediting body before the initiative is implemented. Duke University's regional accrediting body, the Commission on Colleges (COC) of the Southern Association of Colleges and Schools (SACS), is required by the federal government to monitor its constituents' compliance with the substantive change policy and to grant permission for major changes to occur. In order to ensure our compliance, all proposers of new programs, degrees, and other major initiatives should review the substantive change policy at the link provided in Appendix Y of the Faculty Handbook as well as the relevant portion of the SACS website, which contains much useful information: (http://www.sacscoc.org/SubstantiveChange.asp).

In addition, proposers must fill out this checklist and submit it to the Duke University Liaison to SACS. Vice Provost John Simon, before presenting the initiative to the Academic Programs Committee (in the case of academic programs and degrees) or to the University Priorities Committee (in the case of major nonacademic changes).

Please feel free to call Vice Provost John Simon with any questions (660-0330) or to email him at jsimon@duke.edu.

CHECKLIST		
This initiative	Yes	No
Initiates coursework or programs at a		1
more advanced level than currently approved.		×
Expands at current degree level (significant departure from current programs – no closely related counterpart exists among previously		
approved programs in the curriculum) .	×	
Are a number of new faculty required?		×
Are > 25% of the courses new?		
Are \geq 50% of the courses new?	×	
Requires new library or other learning resources		×
Initiates a branch campus.		×
Program will be initiated at new foreign sites.		×

x	Yes	No
Initiates off-campus sites where Student can obtain 50% or more credits toward program.		\times
Student can obtain 25-49% of credit toward program.		×
Adds significantly different program at an approved site.	×	
Initiates distance learning		
Offering 50% or more of program.		×
Offering 25-49% of program.		×
Initiates programs/courses offered through contractual agreement or consortium.		×
Changes the number of credit hours awarded for Successful completion of a program.		×
Initiates a merger/consolidation.		×
Changes governance, ownership, control or legal status.		×
Alters significantly the length of a program.		×
Closes an institution/program; initiates teach-out agreements.		×

Thank you for your attention to this checklist, and for helping to ensure Duke University's compliance with federal regulations.

Proposed Program Master of Biomedical Sciences
School(s) School of Medicine
Point-of-Contact Linda S. Lee, Ph.D.
Date March 25, 2014

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A. Overview of the Field and Program Context

College graduates who are interested in pursuing further study in the health sciences often matriculate directly to a health professions school. Increasingly however, students are pursuing additional educational opportunities that increase their intellectual development, provide in-depth graduate level training, and lay a foundation for success in their professional goals. We describe the principles that guide most Post-baccalaureate Premedical Programs, Special Master's Programs and Professional Science Master's Programs to provide context and to differentiate the proposed Duke Master of Biomedical Sciences from these entities.

Post-baccalaureate premedical programs

Post-baccalaureate premedical program is the broad, generic term used to characterize a wide variety of markedly dissimilar educational opportunities. These programs are broadly designed to boost the preparation of a growing and increasingly diverse population seeking careers in medicine or other health professions. ¹⁻¹¹ The term "post-bac" is generally understood to be a program in which students take coursework, at the undergraduate and/or graduate level, primarily to meet medical school prerequisites. In general, these programs enable potential aspirants to medical and other health professions schools such as, physical therapy, physician assistant, dentistry, and podiatry to complete additional coursework in the foundational basic sciences, demonstrate the ability to succeed in advanced studies, and prepare for national admissions examinations. Some programs target special populations such as those underrepresented in health careers as a strategy to increase the diversity of the healthcare workforce.^{2,4,5,8,10,12-15}

Master's degree programs

Special Master's Programs. These master's degree programs include one- and two-year programs, which vary as to specificity of the degree awarded, e.g. MS in Biomedical Imaging, MS in Anatomy or Physiology, as opposed to a MA or MS in "Medical" Sciences. Georgetown University established a Special Master's Program in Physiology in 1975, the first program of its kind.¹⁶ Students in these programs complete a limited number of medical school courses with medical students and/or complete a concurrent curriculum with medical school faculty and individualized advising. ^{3,16-18} Programs such as Georgetown's are typically referred to as "Special Master's Programs" (SMPs) by premedical advisers and medical schools admissions' officers, and the term characterizes many aspects of the program we propose. ^{2,9,10,16-18}

Professional Science Master's. "Professional Science Master's" (PSM) degree programs

programs "...allow students to pursue advanced training in science or mathematics, while simultaneously developing workplace skills highly valued by employers."¹⁹ Geared more to research, industry and business settings than to preparation for a health profession, they incorporate strong academic science or technological content with professional skills development and an intense experiential component. ²⁰⁻²²The continuing growth and success of these programs since their inception in 1997 is proof of concept that such Master's degrees in the sciences with the integration of scientific, business, and professional proficiency, prepare graduates for jobs for which baccalaureate training alone is insufficient.¹⁹⁻²² The program we propose parallels key attributes of this approach.

Proposed Duke Biomedical Science Master's Degree

What we propose is fundamentally novel: there is no program like it in the country. The proposed Master of Biomedical Sciences degree program will incorporate elements often associated with both "Special Masters Programs" and "Professional Science Master's" degree programs. The program will boost the academic and professional preparation of pre-professional students to enhance their likelihood of admission and, for others, meet the needs of the workplace at the intersection of health care delivery, business and science. The proposed curriculum, with its integrated human biological sciences, robust clinical component and application of team-based learning principles as the pedagogical framework, is grounded in evidence-based health professions educational practice; it yields a unique educational opportunity.

The Duke MBS will be an 11- month professional degree [to be] awarded by the Duke University School of Medicine. The degree requires a total of 38 credits; of these, eleven courses comprise a required core curriculum of 33 credits. The remaining five credits are earned by completing one of two options for an individualized concentration: five credits of approved elective coursework, or a mentored research/focused study project resulting in a written capstone paper for which five credits are awarded. Program goals will be modeled and reinforced through instructional modalities shown to promote academic achievement, critical thinking, scientific inquiry, team skills, capacity for improvement, and cultural competence. These include team-based learning, co-mentored small group seminars, service learning experiences, simulations, critical reflection, and narrative writing. It embeds *pre-professional* students within health care teams as care providers rather than as observers and will provide rich opportunities for continued medical education scholarship thereby advancing evidence-based educational practices in the health professions.

Types of employment that students in this field could expect to obtain

Outcomes reported by graduates of Professional Science Master's programs and matriculation data from by Special Master's Programs directors are promising for graduates of our MBS degree program.

As described more fully later in this proposal in Section G - Comparisons with Existing Programs, Special Master's Programs that report graduate outcomes, indicate that from 50% to 90% of their graduates who apply to medical school matriculate within two years of graduating from their programs. (See Appendix 1)

Surveys by the Council of Graduate Schools demonstrate strong job placement for graduates of Professional Science Master's programs. The most recent study for which data are available (2013 survey of 2011-13 graduates) reports that 70% of the respondents were employed at the time of the survey.²³ Of those, over half were in business and industry, 11% in government, 9% in academia, 9% in start-ups, 8% in non-profits and 6% in other fields such as research and healthcare.²³ As noted in Section P - Opportunities Available to Graduates of this proposal, and as suggested by local experts, we anticipate opportunities in these sectors for our graduates who do not pursue a career in the health professions. (See letters of support: Cavanaugh, Cohen, and Rouse)

Why is there a need for a professional degree in this field?

The impact of rapid changes in the health care environment, particularly with continued implementation of the Affordable Care Act, suggest a critical need for individuals who have a medical sciences background beyond that available at the baccalaureate level, to occupy the space between the patient and traditional health professions. Graduates with a unique combination of science and patient care will have the background that will enable them to interpret and apply expanding technology and medical discoveries to improve health for individuals and populations. Those who hold this degree will be poised to move forward with health professions training or to step into developing areas of translational research and medicine, population health, and personalized medicine.

Ways in which Duke School of Medicine is already established in this field

Although the Duke School of Medicine does not currently offer a Master's of Biomedical Sciences degree, it has a well-established track record of innovation and success in the continuum of health professions education and in its professional master's degree offerings.

Duke SOM is recognized nationally and internationally as a leader in health professions education. The Doctor of Medicine (MD degree granting) program is the only MD program in the US to devote a full academic year entirely to scholarship within a four-year program

and is consistently ranked among the top 10 medical schools. ²⁴ The SOM's Advisory Dean system is known as a visionary effort to integrate ethics and human values into the education of physicians-in-training.²⁵ The establishment of the Primary Care Leadership Track (PCLT) places students in a longitudinal relationship with faculty and patients and embeds them directly into community organizations.²⁶ The PCLT is one example of the SOM's leadership in population health studies at the undergraduate medical (MD) and graduate medical education (GME) levels.^{27,28}

The SOM collaborated with the National University of Singapore in efforts supported by the Singapore Ministry of Education to develop and launch the Duke-NUS Graduate Medical School, now known for Team LEAD (Learn, Engage, Apply, Develop), an innovative application of team based learning (TBL) in place across its entire first year preclinical sciences curriculum.^{29, 30,31}

In addition to the medical student program, the SOM is home to other established and leading professional health programs. The Physician Assistant Program was first of its kind, created post WWII to leverage the skills and expertise of returning veteran medics and consistently is ranked first among US Programs.^{32,33} The Duke Physical Therapy program is one of the oldest programs in the nation and was the third to receive accreditation as a Doctor of Physical Therapy (DPT) granting program when the profession shifted to the clinical doctorate model.³⁴ It ranks among the top 15% of programs nationwide. In addition, the SOM is one of only twelve sites in a network of highly regarded and successful summer programs for underrepresented and first generation college students aspiring to enter the health professions, the Summer Medical and Dental Education Program (SMDEP).³⁵ At the graduate medical education (GME) level, Duke has over 80 accredited and highly competitive residency and fellowship programs involving nearly 1000 trainees annually in training programs recognized nationally for excellence and innovation.³⁶

In addition to these highly regarded clinical training programs, the School of Medicine has demonstrated forward-thinking leadership in the development of ground-breaking professional master's degree programs. The genesis of the current MBA Health Sector Management program in the Fuqua School of Business, which enrolls over 400 students per year, was Duke's hospital administration program which began in the 1940s and became a School of Medicine master's degree program in 1964, moving to Fuqua in 1986.³⁷ The Clinical Research Training Program (CRTP), first launched in 1983 as the Biometry Training Program, fourteen years <u>prior</u> to the National Institutes of Health (NIH) Director's Panel on Clinical Research that in 1997 called for grantees to provide formal training in clinical research for physicians and to promote clinical research careers among

medical students.³⁸ The CRTP was one of the first master's level academic programs in the country dedicated to physician training in the quantitative principles and practices of clinical research and now trains clinical and translational investigators on the Durham campus of Duke Medicine, at the National Institutes of Health in Bethesda, Maryland, and at the Brazilian Clinical Research Institute in Sao Paulo, Brazil. In similar manner, the Master of Health Sciences in Clinical Leadership, established in 2000, and the Masters of Management in Clinical Informatics, were first of their kind professional master's degrees.

In addition to the SOM's programmatic excellence, SOM faculty are recognized as active scholars for their contributions to the health professions education literature in peer reviewed journals. Recent examples (with MBS leadership indicated by boldface) include:

- Andolsek K, Murphy G, Nagler A, Moore P, Schlueter J, Weinerth J, Cuffe MS, Dzau VJ. Fostering Creativity: How the Duke Graduate Medical Education Quasi-Endowment Encourages Innovation in GME. *Academic Medicine*. 2013 Feb. 88(2):185-191 PMID: 23269302.
- Andolsek K, Murphy G, Pinheiro S, Petrusa E, Tuck T, Weinerth J. Efficacy and Efficiency of Webcast Orientations Versus Live Resident Orientation: Results of a 2- Year Survey. *Journal of Graduate Medical Education*, 2010; 2(1):136-140.
- Andolsek KM, Nagler A, Weinerth JL. Use of an Institutional Template for Annual Program Evaluation and Improvement: Benefits for Program Participation. *Journal of Graduate Medical Education*, 2010;2(2):160-164.
- **Buckley EG**, Grochowski CO. Duke University School of Medicine. *Academic Medicine*. 2010 Sep;85(9 Suppl):S418-20.
- Cabrera A, Lee WR, Madden R, Sims E, Hoang JK, White LE, Marks LB, Chino JP (2011) Incorporating gross anatomy education into radiation oncology residency: a two-year curriculum with evaluation of resident satisfaction. Journal of the American College of Radiology 8:335-340.
- Kamei RK, Cook S, Puthucheary J, Starmer CF. 21st Century learning in medicine: traditional teaching versus team-based learning. *Medical Science Educator* 2012;22:57-64.
- Kaprielian VS, Silberberg M, McDonald MA, et al. Teaching population health: a competency map approach to education. *Academic Medicine* 2013;88:626-37
- Lee LS, Pusek SN, McCormack WT, Helitzer DL, Martina CA, Dozier AM, Ahluwalia JS, Schwartz LS, McManus LM, Reynolds BD, Haynes EN, Rubio DM. Clinical and translational scientist career success: Metrics for evaluation. *Clinical and Translational Science*, 2012;5: 400–407.
- **Muzyk AJ**, White CD, Kinghorn WA, Thrall GC. A psychopharmacology course for psychiatry residents utilizing active learning and residents-as-teachers to develop life-long learning skills. *Academic Psychiatry* 2013;37:332-335.
- Nagler A **Andolsek K** Rudd M Sloane R Musick D Basnight L. The professionalism disconnect: Do entering residents identify yet participate in unprofessional behaviors? *BMC Medical*

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- Nagler A, Andolsek K, Dosary K, Schlueter J, Schulman K. Addressing the Systems-Based Practice Requirement with Health Policy Content and Educational Technology. *Medical Teacher*, 2010;32(12):3559-65.
- Nagler A, **Andolsek K**, Schlueter J, Weinerth J. To Match or Not: What Factors Influence a Resident's Choice of GME Program. *Journal of Graduate Medical Education*, 2012;4(2):159-164.
- Rubio DM, Schoenbaum EE, Lee LS, Schteingart DE, Marantz PR, Anderson KE, Platt LD, Báez A. Esposito K. Defining translational research: Implications for training. *Academic Medicine* 2010;85(3):470-475.
- Samsa GP, Thomas L, Lee LS, Neal EM. An active learning approach to teach advanced multipredictor modeling concepts to clinicians. *Journal of Statistics Education* [Online] 2012;20(1). <u>www.amstat.org/publications/jse/v20n1/samsa.pdf</u>.

Intellectual Basis for the Degree

The intellectual basis for the degree and its program of study is grounded in Boyer's conceptualization of intellectual life as a broader experience that includes the scholarship of integration/synthesis, of application/engagement, and of teaching in addition to the scholarship of discovery.³⁹⁻⁴²

The Duke MBS is focused on graduate-level intellectual development. Rather than borrowing a teaching philosophy from the medical school curriculum exclusively, it borrows from the pedagogical approaches used in more traditional graduate programs. By engaging faculty with PhDs who have been active in doctoral programs on the Duke campus, the program proposed here is not simply a short version of a medical school. It is instead a curriculum that focuses on development of inquiry, an understanding of complexity, and ways in which to develop knowledge through directed readings and seminar-style discussion. Taking one course—Human Structure—as an example allows us to illustrate this approach. Human anatomy has a tendency to become simple content delivery in which facts about anatomy are presented in a rigid fashion. This unfortunately misses a central point of inquiry-based learning in anatomy: that there are guiding principles (i.e. mechanical, genetic, epigenetic, and phylogenetic) that inform anatomical arrangements. Students in this program will learn those principles and apply them. This will be true in physiology and neurosciences as well. This approach allows our students to encounter new material with facility and apply larger principles to knowledge construction throughout their lifetimes. Moreover, although anatomy is always treated as if all information were known, there remains considerable variation and ambiguity; we often understand where things are but their functional relationships are unknown. We

plan to discuss what is known, what is not known, and, most importantly, what we would need to do to fill in these gaps. That approach demands the use of primary literature and critical thinking and evaluation. An approach that examines what is poorly understood encourages students to go beyond the surface of their learning. It also encourages students to consider pathways in research. In the end these approaches will be applied to real-world problems. This will be made possible through the combined didactic, seminar, and team problem-solving structure proposed. That approach embraces the intellectual principle that this Masters program is about inquiry and understanding rather than simply knowledge acquisition.

B. Key Features of the Proposed Degree Program: A Synopsis

Type of degree to be offered

The proposed degree will be a professional master's degree conferred by the School of Medicine.

Program leadership structure

The proposed program's home is the School of Medicine under the Office of the Vice Dean for Education (Edward G. Buckley, MD). Kathryn M. Andolsek, MD, MPH, Assistant Dean for Premedical Education in the School of Medicine and Professor of Community and Family Medicine, will provide academic leadership and direct oversight of the program. The program will be directed by Linda S. Lee, PhD, Associate Professor of the Practice of Medical Education, with the assistance of Associate Directors Joseph A. Jackson, MD (Assistant Professor of Pediatrics) and Leonard E. White, PhD (Associate Professor of Orthopaedic Surgery). It will be administered by the Medical Education Administration unit of the School of Medicine, which is led by Stacey McCorison, MBA, Associate Dean for Medical Education Administration.



Major components of the curriculum

The degree program will be full-time for three consecutive terms over ten months (40 weeks total) and will require the students to be in residence and on campus. The degree requires a total of 38 credits; of these, 11 courses comprise a required core curriculum of 33 credits with the remaining five credits dedicated to elective individualization. (Full

description in Section H - Curriculum Considerations). Advising is a major component of the program. Each student will have an assigned MBS faculty advisor. They will also receive advising from an OHPA advisor, and a dedicated career consultant.

The curricular components are grounded in appropriate literature. These components and supporting pertinent citations include:

- rigorous graduate level academics;^{43,44}
- an integrated human biological sciences curriculum including gross anatomy with cadaveric dissection, that further integrates with concurrent Emergency Medical Technician (EMT) training;^{43,45,46}
- direct responsibility for patient care as a member of the health care team via EMT training and completion of clinical shifts with campus- and community-based EMS squads;^{43,45,47,48}
- a longitudinal curriculum in the art and science of medicine for professional formation including professionalism, communication and teamwork skills; selfawareness and self care;^{43,45,48-62} and
- elective options enabling individualization for unique needs and interests^{43,45}

Type of training that specifically addresses professional issues in the field

The curriculum has been designed to include graduate level course work in the human biological sciences, experiential learning centered within team-based patient care, practical simulations, and assessments designed to address the recognized competencies expected of physicians and other health care professionals.⁴⁴:

- Patient Care
- Knowledge for Practice
- Practice-Based Learning and Improvement
- Interpersonal and Communication Skills
- Professionalism
- Systems-Based Practice
- Interprofessional Collaboration

The curricular experiences are highly integrated with one another. The plan for implementation within the curriculum is described in Section H. Curriculum Considerations; a complete description of these domains and sub-competencies is provided in Appendix 3.

Mechanism for supporting faculty time

Support for faculty effort devoted to the development and implementation of the MBS is

proceeding in two phases: program and course development (FY 14 and FY15) and program implementation (starting in FY16). The current developmental phase is supported through SOM reserves (Section K - Financial Considerations). The program implementation phase will be funded through tuition and fee revenues, decreasing the need for SOM reserve funds over time. We will use the existing financial model for supporting educational effort in the School of Medicine, described more fully in Section K-Financial Considerations.

Ways in which the program will be financially viable

It is anticipated that the program will be financially viable (in terms of revenues covering expenses) by Year Three when it anticipates a class size of forty students (Section M – Five Year Student, Faculty, and Resources Projections). The SOM development staff will identify opportunities for securing additional funding through philanthropy; the MBS program leadership will seek grant support. These potential funding sources will be pursued to support program enhancements and special projects; however the MBS will be self-supporting and sustainable through tuition revenues and fees as described in Section K – Financial Considerations.

C. Rationale: Why should Duke University launch the Master of Biomedical Sciences Program?

In its October, 2009 report, the Ad Hoc Committee on Master's Programs "…was unanimous in agreeing that there are many positive impacts from establishing new master's programs, including providing a critical mass of students for some courses and programs, providing links for advanced undergraduates, and fulfilling the strategic initiative of knowledge in the service of society. Such programs can also provide a unique and valuable option for students from a career development perspective. Employment opportunities and competing in a global economy can be enhanced for students in these programs, making the programs potentially central offerings for the university's mission." ⁶³

The proposed program will provide such positive institutional impacts. In the service of society, it will extend the reach and impact of Duke's highly recognized medical and scientific training programs to a talented population of students. It will do so first, by filling a void that exists currently among its peer institutions (see Section G – Comparison with Existing Programs), and secondly, by broadening the opportunities for underrepresented minorities and first generation college students in the health career pipeline at Duke and nationwide. Although not our only target applicant pool, we believe we can respond to the vision and values articulated in the 2012 report of the Duke School of Medicine's Office of Diversity and Inclusion "Charting the Path Towards Inclusive Excellence" and weave diversity and inclusion deliberatively and intentionally into our program's culture.⁶⁴ We first intentionally built a leadership team reflecting the diversity we desire in our student cohorts. We have created a financial plan that commits a minimum of 15% tuition revenue each year to scholarships, a feature that sets us apart from others. Third, we believe we can learn from the successful practices of the MD and PA programs which consistently matriculate 20% or more unrepresented minority and first generation college students (URMs and "First Gens") in each entering class; in fact the medical school minority's recruitment rates have exceeded national averages since 1996. In addition we are collaborating with our extremely successful Summer Medical and Dental Education Program (SMDEP) conducted by the SOM Office of Multicultural Affairs. We will aggressively reach out to historically black colleges such as North Carolina Central University locally and to organizations such as the Minority Association Pre-Medical Students (MAPS).

The MBS will enhance the University's ability to expand its scholarship beyond discovery to the scholarship of integration, application/engagement and teaching and learning.

In addition, the MBS will increase collaboration among the SOM and other schools within Duke to meet the needs of a variety of students who wish to explore health professions careers or develop new skills to make them more translational in the evolving biomedical professions of the future. It will respond to faculty interest and enthusiasm in interdisciplinary collaborations. It will expand opportunities for medical education scholarship. It will enable the SOM to leverage more efficiently available resources by providing a critical mass of students to support a core faculty dedicated to teaching in the preclinical biomedical sciences.

A final, and critically important, rationale for offering the Master of Biomedical Sciences is that by NOT doing so, Duke University will miss a time limited opportunity to enter a vibrant and growing educational space, one in which to demonstrate academic leadership and innovation. Cases in point are three examples of recent activity by peer and competing institutions. In the year that passed between the Fuqua Consulting Team's presentation of findings in the spring of 2012, and the June 2013 appointment of the MBS Program Director to initiate program/proposal development, Johns Hopkins University received approval and launched its "Health Science Intensive" concentration within its existing Master of Biotechnology degree program with a goal "... to attract students to a specialized curriculum that would allow them to complete advanced science course work to improve their credentials in preparation for application to medical schools." ⁶⁵ In the time that elapsed since we first started drafting this proposal in July of 2013, Wake Forest University, which has had an established post-baccalaureate certificate program for underrepresented minority students, folded its existing program into its Master of Biomedical Sciences degree program and admitted its first such class of students for Fall of 2014. Another new program that has emerged as we moved our proposal forward for approval is Georgetown University's second Special Master's Program in Physiology ("GeorgeSquared"), in partnership with George Mason University in Manassas, Virginia.⁶⁶ We believe, and the marketing study completed in 2012 by the Fuqua Consulting Team strongly suggested, that there is a window of opportunity during which we will be most successful in recruiting quality students, implementing a program and establishing a track record of successful outcomes for our graduates. 67,68

What does the program offer that would complement or detract from existing academic programs at Duke?

At its most basic level, this program will contribute directly to Duke University's mission to "...prepare future members of the learned professions for lives of skilled and ethical

service...to help those who suffer, cure disease and promote health.... [and] to provide wide ranging educational opportunities...."⁶⁹ More specifically, however, the proposed MBS program will extend the impact of Duke University's strong biomedical and health science education programs in the following ways:

Complementing existing programs

Duke's MBS program will enable us to further recruit, develop, reward and retain basic science educators, a talented group of scientists that is becoming increasingly scarce, to teach in our health professions programs. An additional cohort of learners will allow creative and innovative faculty, whose primary scholarly focus is teaching, to devote a greater proportion of their professional effort to this activity. It will also allow them to innovate, implement, and evaluate the outcomes and impact of teaching strategies with a different group of learners, enabling them to disseminate their generalized knowledge within health professions education.

In addition the MBS will complement existing programs by:

- Fostering further development of pedagogical innovation and of interdisciplinary teaching teams among the foundational biological and clinical sciences;
- Increasing opportunities for scholarship in medical education research;
- Filling a gap in the institutional health professions education "pipeline;" (See graphic next page)
- Providing additional financial support for the resources required by the Offices of Health Professions Advising and Career Services;
- Enhancing our ability to recruit, reward, and retain faculty who value teaching as their primary professional mission;
- Strengthening relationships among the many units of the University engaged in premedical/prehealth education and advising through improved and intentional communication led by the newly appointed Assistant Dean for Premedical Education;
- Increasing the visibility of Duke's related graduate programs (e.g. physical therapist, pathologist assistant, basic sciences, global health) thereby expanding potential course offerings and potential applicant pools;
- Diversifying the applicant pool for training in the health professions, for the programs to which MBS graduates apply as well as for Duke programs, ultimately leading to further diversity in the health professions; and
- Clarifying the differences among health professions programs and professional roles to better enable our students to meet the best match for training and career opportunities.

Detracting from existing programs

The extensive groundwork and consultations conducted during the development of this full proposal (see Appendix 4 for names and positions of consults) leads us to believe that establishment of the proposed MBS does not pose any substantial risk of stressing or detracting from existing programs and services. In light of concerns raised by University committees in recent years regarding the increasing number of new Master's degrees and potential negative consequences for existing academic programs, campus support services, and faculty, we carefully undertook due diligence to investigate potential impacts and to build into our program mechanisms for mitigating them.

	Baccalaureate	Post- baccalaureate pre-	Graduate School	Professional	Postdoctoral
		professional		l	
UNIVERSITY	Premedical; OHPA	Academic	Master's in Global Health		
ENTER	Summer Medical/ Dental Education Program (SMDEP)	riogrann Gap	Duke Scholars in Molecular Medicine (DSMM)	MD; MHS; MHS-PA; MHS- CL; MHS-CR; MMCi; DPT	Graduate Medical Education (Residency, Fellowship)
MEDICAL CE	ABSN		PhD-Nur	MSN; DPN	Duke Scholars in Molecular Medicine (DSMM)
				Continuing Medical Education	Continuing Medical Education

Current Duke Health Professions Education "Pipeline"

Impact on existing Duke graduate degree programs

Our review of existing related degree programs later in this section indicates that the proposed MBS will neither conflict nor compete directly with any existing programs. As indicated in our review, there are no existing post-baccalaureate premedical/prehealth degree programs offered by Duke University or by any of its professional schools. The directors of the existing professional Master's and doctoral programs of the School of Medicine are universal in their support and endorsement of the MBS. (See Section L - Endorsements)

Of the related programs, only one raised concerns of potential competition: the Master of Science in Global Health (MSc-GH) program. A small number of MSc-GH (9 students, averaging <2 per year, or approximately 10% of graduates since the program's inception in 2009) have ultimately matriculated to medical school.⁷⁰ However, the program goals, target applicant pool, and program emphasis as a research-focused degree differ clearly from those of the proposed MBS program. We believe that the presence of our MBS program will benefit the MSc-GH by increasing the visibility of potential applicants to health related programs at Duke, and by the referral to MSc-GH any potential applicants/aspirants whose career interests resonate more closely with a program focused on research methodology in general and global health in particular. We look forward to developing opportunities for collaboration with the MSc-GH program leadership and faculty.

One such opportunity for immediate collaboration appears evident from a significant gap that we have identified within our University community: presently there is no entity assigned specific responsibility for systematically advising Duke graduate students (who have not recently acquired an undergraduate degree from Trinity College of Arts and Sciences or Pratt School of Engineering) regarding a health professions career. OHPA's responsibilities are limited to Duke undergraduate students and to recent Duke graduates. The graduate students who have already sought us out have helped us understand how the MBS may help close this gap.

Impact on campus services

We believe we will have minimal impact on existing campus services. We have consulted with the directors of the Duke Police (Dailey); English for International Students (Parker); Parking & Transportation (Harden and Landis); Counseling and Professional Services (Collins); Student Health (Vaughn); Housing, Dining and Residence Life (Johnson); Office of Health Professions Advising (Scheirer); Center for Career Services (Wright-Swadel); and the Medical Center Library (Thibodeau) as well as the Vice President for Administration (Cavanaugh), Vice President for Student Affairs (Moneta), and Assistant Vice President for Student Affairs & Dean of Students (Wasiolek). These individuals have expressed support for the development of the MBS program and have provided guidance on strategies for facilitating program success and appropriate support of our students as described in the letters listed in Section L – Endorsements and included in Appendix 14. In addition, the EMT training and service component was noted as a tremendous benefit to the University campus; without the services of these students on the Duke EMS service, delays in care for our students, staff and visitors could result. (See Section L - Endorsements).

Impact on faculty

Development and implementation of the MBS presents an opportunity to retain, foster, mentor and support our current faculty interested in health professions and science education and the scholarship of teaching and learning as the major focus of their Duke professional activity. This includes responding to their passion for innovating curricula and assessment strategies, and in supporting their professional development, research and scholarship in health professions education.

We are already providing financial support for such faculty effort during the program development phase as described in Section K, and will financially support faculty teaching effort thereafter in keeping with the School of Medicine's existing model, also described in Section K.

We anticipate long-term benefit for the faculty who participate in the MBS. Our program values (see Appendix 2) promote curricular and pedagogical innovation and interdisciplinary teaching. The development, implementation, and evaluation of the program will provide many opportunities for scholarship in medical education research. Our faculty appointment procedures as described in Section F-Program Structure will aid faculty in developing their portfolios used for documenting their progress toward promotion and tenure. The program will promote an atmosphere in which faculty who value teaching and educational scholarship as their primary professional mission will be supported and valued.

What will make Duke among the top programs in this field?

The program we propose is unique in content, structure, and pedagogy. As described earlier, among the features that distinguish the Duke MBS from other programs in the field is the emphasis on critical thinking, integration of content, and application to clinical problem solving and professional formation. This is accomplished through active participation in integrated experiences in graduate human biological sciences including

gross anatomy with cadaveric dissection; direct patient care experience as a health care team member rather than observer; skill development in communication; and team work, and an option for pre-matriculation advising. In addition, the program leadership and faculty are the very faculty who also lead and teach key components of the Duke medical student, physical therapy, and physician assistant curriculum, which as noted earlier, are consistently ranked in the top tier among their peers.

Our goal (Section E) is to effectively mentor our students in considering the full breadth of opportunities for success in the health professions and/or related biomedical fields, and advance their career explorations. By so doing we aspire to be one of the top such master's degree programs by premedical and prehealth advisers within five years. The caliber of the faculty; the innovative curriculum and pedagogy; the early, longitudinal and individualized advising; the commitment of the program to conduct scholarship in service to the program, institution, and the profession; and the established excellence of the institution will make Duke among the top programs in this field.

Review of existing programs at Duke and potential overlap

Currently, there does not exist a formal degree granting post-baccalaureate premedical/health degree program at Duke University. As the primary target population from which the MBS will draw students consists of those who have already completed their undergraduate academic prerequisites for health professions' schools, the proposed program will neither overlap nor compete with the existing undergraduate programs for pre-health students. Rather, the proposed program will complement existing programs and enable the Office of Health Professions Advising to expand its partnership with the School of Medicine and the administrative faculty of the MBS program.

Programs within the Duke Graduate School

Master of Science in Global Health. The Master of Science in Global Health (MSc-GH) launched in 2009, aims to train its graduates to engage in clinical, epidemiological, social-behavior and policy-oriented research, as well as contribute to the design, implementation, and management of health programs. ⁷¹ As noted earlier in this Section, a small number of graduates do matriculate to medical school. However, the program's focus is training in research rather than preparation for professional school matriculation.

Master of Arts in Bioethics & Science Policy. This new master's degree program aims to prepare its graduates "...to identify, analyze, and propose solutions to a myriad of complex issues at the intersection of science, technology, ethics, and policy." ⁷² It is

designed largely to meet the needs of professionals with prior work experience or those who desire to move in a different career path, and of students who are already pursuing other professional degrees and desire more depth in the study or bioethics and science policy. It is not focused on preparation for matriculation in medicine or related areas.

Biomedical Graduate Programs. The biomedical science programs are doctoral level scientific training programs, not premedical programs aiming to prepare students for medical school.

Programs within the School of Medicine

Non-degree program

Duke Scholars in Molecular Medicine Program.

(http://mmscholars.medschool.duke.edu/about-program) This program is designed for PhD students and postdocs who are seeking clinical experiences to augment their academic training in the sciences. This program was initiated on the premise that more impactful biomedical science may be performed by scientist who understand unmet clinical needs, appreciate first-hand the clinical context of their research, and work in collaboration with clinical colleagues. To achieve this goal, the program brings predoctoral and post-doctoral trainees into Duke Medicine clinics and clinical training venues for 4 hours a month to develop these key insights and strategic relationships. The MBS program aims to achieve some of these goals (e.g., building appreciation for the clinical context of medical knowledge), but for an entirely distinct set of learners within a comprehensive, sequenced, three-semester curriculum. Thus, there is no competition between the Duke Scholars in Molecular Medicine program and the proposed MBS program.

Degree and certificate programs

The Duke School of Medicine is home to nine degree or certificate granting programs in the health professions. These programs meet the specific educational and credentialing needs of specific groups of biomedical and healthcare professionals as outlined in the table below. Other than offering selected courses in the Physician Assistant, Biostatistics, and Clinical Research Training programs that may be appropriate electives for individual students in the MBS program, these existing programs do not overlap with the goals nor compete for the same target audience of the proposed MBS program.

Program	Culminating degree	Program goal
Doctor of Medicine	Doctor of Medicine (MD)	Train future physicians
Clinical Informatics Training	Master of Management in	Training for managerial and executive
Program	Clinical Informatics	positions in health care information
	(MMCi)	systems and technology
Clinical Research Training	Master of Health Sciences in	Training for careers in academic
Program	Clinical Research	medicine by postgraduate clinicians
	(MHS-CR)	
Doctor of Physical Therapy	Doctor of Physical Therapy	Entry level degree for licensure as
	(DPT)	physical therapist
Master of Biostatistics	Master of Biostatistics	Employability as staff statistician
	(MB)	and/or acceptance to PhD program
Master of Health Sciences in	Master of Health Sciences in	Clinicians preparing for leadership in
Clinical Leadership	Clinical Leadership	medical practice, health systems, and
	(MHS-CL)	management.
Ophthalmic Medical	Certificate	Eligibility for JCAHPO certification as
Technician		ophthalmic technicians.
Pathologists' Assistant	Master of Health Sciences	Eligibility for ASCP certification as
Program	(MHS-PA)	pathology lab assistants.
Physician Assistant Program	Master of Health Sciences	Eligibility for certification as Physician
	(MHS)	Assistants, which is required to obtain
		state licensure to practice.

The proposed MBS does not overlap with the Duke School of Medicine's MD, PA and DPT programs or any program in the Duke School of Nursing. Rather, the program complements the existing programs and creates synergy across programs by virtue of the engagement of faculty from those programs in the development of the MBS. In addition, the MBS will strengthen the applicant pool for the MD, PA, and DPT programs by enhancing the academic preparation of diverse candidates who may be highly desired by these programs.

What resources at Duke would contribute to the success of this program?

There are a number of key resources that we believe are especially critical to the success of this program.

First among these are the dedicated, enthusiastic, and world-class faculty who are creating the innovative courses and elements within them that will integrate and reinforce key concepts and skills across the curriculum. In addition, many of these faculty are highly skilled in developing effective flipped classroom experiences, and are leaders in the team-based learning pedagogy (TBL) that we are adopting. These same faculty are collaborating in research on TBL with colleagues at Duke-NUS Graduate Medical School in Singapore. The inclusion of gross anatomy with cadaveric dissection is a feature that distinguishes the proposed program from those at other institutions. Another is the partnership with Office of Health Professions Advising, with its strong track record of successful admissions to medical and professional health schools. In addition, the support and engagement of Duke Medicine (including Duke University Hospital Emergency Services, (see letter of support: Underhill) will provide students with a unique view and understanding of the health care system as well as mentoring from skilled and knowledgeable health care providers.

What benefits are there to participating faculty?

As noted earlier in this Section on "Impact on Faculty," the benefits to participating faculty are many. The faculty are among the major drivers behind this program, recognizing the opportunity to fully develop a community of health professions educators in the basic science arena. They are excited about the potential for creating innovative new curricula and adapting content and pedagogy to a new learner cohort. This program has the potential to serve as a unique "learning laboratory" for innovation and discovery in the Duke School of Medicine. It will enhance the ability of faculty to conduct medical education research and to contribute to the scholarship of teaching and learning. The Duke School of Medicine and its faculty-educators recognize that keeping pace with such reform and continuing developing best practices for education within the health professions requires increased administrative agility, an interest in educational experimentation, and a right-sized cohort of learners and faculty. These characteristics are embodied in our proposal for the Duke MBS program. Indeed, this is a "missing piece" in the educational arena within the School of Medicine and the broader continuum of the health professions pipeline. Duke has distinguished itself in providing development opportunities in the local public schools, summer enrichment for first generation and

underrepresented minority undergraduates, and superb health professions programs, continuing medical education and postgraduate education. This additional piece will complement Duke's offerings.

How would the reputation of Duke as an institution be enhanced by this new program?

The Duke School of Medicine (SOM) enjoys a reputation for educational innovation, and has been at the forefront of educational innovations that are now considered mainstream in medical and health professions education. The proposed program is another example of such innovation. It embeds *pre-professional* students within health care teams as care providers rather than as observers, captures the best elements of two specialized master's degree approaches, and adopts a pedagogy (team-based learning) that promotes skills desired in the health care systems and scientific workplaces of the future.

The program will provide rich opportunities for continued scholarship around the application and evaluation of innovative educational strategies thereby advancing evidence-based educational practices in the health professions. It will also enable us to address the existing deficit in the professional literature regarding this population of learners, especially those who pursue non-physician careers.

D. Global Considerations for the Program

The program as proposed will be offered on the Durham campus of the University and enrollment will be limited to US Citizens, permanent residents and nationals. Thus the proposed MBS program does not present global implications or considerations at this time as described in the "Considerations for Developing Potential New Professional Master's Programs at Duke University." ^{73,74}

E. Vision

Our overarching vision is to create a program that is geared to meet future needs, to enhance the scientific and professional preparation of students aspiring to a career in the health professions or in a related career that is enhanced by having a background in graduate level medical and human biological sciences.

Our goal is to effectively match our students with the best opportunities for success in the health professions and/or related biomedical fields, and by so doing be described as one of the top such master's degree programs by premedical and prehealth advisers within five years.

What is it that you want to achieve?

By establishing the MBS program, we will enhance Duke's reputation as an institution that prepares "the next generation of professional...leaders"⁶⁹ by *educating and mentoring individuals who will be highly competitive candidates for schools of medicine and related biomedical/health science careers*. We strive to be exemplars of diversity, leadership, self-awareness, service, and teamwork; to foster a joy and passion for learning; and to develop individual and collegial professionalism. (See Appendix 2)

We also believe we have the opportunity to engage in and contribute to the third emerging paradigm of diversity which has evolved over the last 50 years, described by Nivet as "Diversity 3.0." In this view, diversity emerges beyond the construct of social justice and fairness, to become a lever that drives high performance and innovation within organizations.⁷⁵

How will you enhance knowledge in the service of society?

The development and evaluation of our program will provide two key opportunities to advance knowledge in the service of society. One, by taking an evidence-based approach in developing the curriculum, we will contribute further to discovering and disseminating best practices with respect to post-baccalaureate learners that can be applied broadly across institutions and health professions. Secondly, the EMT component allows us to evaluate the impact of this sort of training early in one's medical career (in this case, PREmedical) on the higher health professions' competencies, particularly professionalism, teamwork, communication skills, and system-based practice.

How will you advance the field?

Duke University will make a unique contribution to the field by advancing the scholarship of medical education outcomes research. Currently graduate outcomes by existing

programs, when reported, are selective, limited, and lack consistency across programs nationally. We plan not only to track, assess and report our graduate outcomes but also to develop research and scholarship around this aspect of health professions education. We will contribute to scholarship by evaluating our efforts and disseminating lessons learned.

How will your training position your students to advance in their careers and become leaders in the field?

Students will gain graduate level knowledge and discrete skills. They will also have the opportunity to reflect on their educational and clinical experiences, practice authentic self-assessment and with mentoring, set personal improvement goals. Some of their skills development will target leadership skills such as critical conversations, emotional intelligence, and conflict management.

How will your program enhance the reputation of Duke?

As noted earlier, we aim to be recognized as one of the most sought after postbaccalaureate premedical master's degree programs within five years. Duke University's Trinity College of Arts & Sciences is already recognized as a leader in undergraduate premedical preparation and advising; the School of Medicine has long been recognized as a top ten medical school known for its singularly unique curriculum and for the development of forward looking clinical and professional masters degree programs. This program will further enhance these reputations collectively through intentional collaborations that more fully leverage the best of both. In addition, our scholarship in the area of team-based learning will enhance Duke's reputation as a leader in educational innovation.

What are your "big dreams"?

Our "big dreams" are that

- The MBS will remain responsive to the needs of society, in part through helping to create a diverse health professions workforce;
- The MBS will be a catalyst for greater integration among the faculty and students in all graduate and professional programs across the University with an interest in health professions education and in enhancing the preparation of students for a future which would entail the nexus of human biological sciences with medical arts and sciences;

- The program will catalyze innovation across the health professions educational programs within the Duke School of Medicine and serve as source of evidence for future best practice models for health professions education; and
- The program will be a model for pre-professional master's degree education that is rigorous, learner-centered, accountable, effective, and humanistic.

List the goals you have for the first five years that will help bring about your vision

We have thirteen goals for the first five years of the MBS, which we have organized in five categories: Matriculation, Programmatic, Scholarship, Graduates, and Institutional.

Matriculation:

Goal One: We will meet/exceed target enrollments in each of our first five years.

Goal Two: We will have a diverse student body, especially in regards to students historically underrepresented in the health professions/sciences.

Programmatic:

Goal Three: Faculty will have a high degree of satisfaction and feel rewarded for their contributions in terms of career support, recognition, rewards, and promotion.

Goal Four We will establish linkage agreements with at least three health professions' programs to provide a guaranteed interview for a subset of successful MBS students.

Goal Five: We will expand the number of elective offerings.

Goal Six: The amount of scholarship aid available for our students will increase by 50%.

Scholarship

Goal Seven: We will disseminate scholarly works including peer-reviewed presentations, abstracts, and published manuscripts annually.

Goal Eight: Faculty will be involved in national associations pertinent to health professions education, advising, and innovative educational practices.

Graduates

Goal Nine: At least 90% of our students will report satisfaction with the MBS.

Goal Ten: At least 90% of the students who are good fits for a health professions career and who wish to pursue a health professions education will gain admission to a health professions school.

Goal Eleven: At least 90% of the students who are not good fits for a health professions career will identify and successfully pursue an alternate career path.

Goal Twelve: We will establish regular paid internship agreements with five local biomedical companies providing evidence that our students and graduates perform well in related biomedical fields.

Institutional

Goal Thirteen: We will pioneer and catalyze innovation for health professions' education within the SOM and serve as a source of evidence for future best practice models.

F. Program Structure

Academic Structure and Faculty Governance

The MBS program's academic structure is integrated within the academic structure of the School of Medicine. Academic oversight falls under the Vice Dean for Education, with primary program oversight under the purview of the Assistant Dean for Premedical Education. The curriculum proposed here and under development is directed by the program faculty, with guidance from a faculty led Curriculum Committee.



Faculty Appointment and Review Procedures

Faculty appointment

The inaugural cohort of faculty for the MBS will be drawn, with departmental approval, from those currently holding faculty appointments in the Duke University School of Medicine and Trinity College of Arts & Sciences; new faculty hires will not be required at this time.

The Assistant Dean for Premedical Education will confirm on an annual basis and by letter, appointments to the Faculty of the Master of Biomedical Sciences. The letter will detail the expected role, effort and compensation as well as the annual evaluation process. In

addition, as appropriate pending individual status with regards to AP&T, the letters will include confirmation of progress toward expected promotion and/or other milestones.

Faculty review

Faculty will meet with the Assistant Dean for Premedical Education on a yearly basis to review and discuss the following: a self-assessment, a peer assessment, student course evaluations, and progress toward meeting other measures and milestones as identified in the letter of appointment. A letter summarizing the review will be sent to each faculty member's department/division chair.

Anticipated Committees

MBS Advisory Committee. As noted earlier, an initial advisory committee was convened by Dr. Dona Chikaraishi in 2011 to explore the feasibility of Duke SOM developing a premedical master's degree program. The membership of that committee is listed in Appendix 5. An expanded Advisory Committee was convened by Dr. Linda Lee following her appointment by Vice Dean Buckley as the Program Director and has been in place since July of 2013. The membership of that committee is listed in Appendix 4, and includes a Duke SOM medical student who completed a MS in Medical Sciences degree prior to matriculating at Duke. This committee will continue until program approval is granted by the Duke University Board of Trustees, at which point a new Advisory Committee will be constituted to contribute to the implementation and launch of the Program.

Curriculum Committee. A subset of the Advisory Committee described above has served as a curriculum committee to lead development of the proposed curriculum and identification of appropriate teaching faculty and other resources. The membership of that committee is listed in Appendix 4, and like the Advisory Committee, includes a Duke SOM medical student who matriculated at Duke after completing a MS in Medical Sciences degree program. That committee will be reconfigured to include primarily the directors of the various program/curriculum components and, in addition to a Duke MD student, the addition of students enrolled in the MBS program once students matriculate.

Program Evaluation Committee. Program leadership, core faculty and eventually a student representative will serve on this committee. On a twice-yearly basis, they will monitor the critical outcomes and impact of the program in order to measure progress toward goals and to identify and prioritize opportunities for program enhancements and innovations. The process is analogous to continuous quality improvement, applied to education. The Committee will develop one or more action plan(s). Reports will be submitted to the

School of Medicine Master's Oversight Committee, described in Section I, Program Evaluation.

Other Committees. As we move forward with program development, existing committees will be reconfigured as described and additional committees will be established with the responsibilities described in the table following. Student representation will be expanded to include MBS students once they matriculate, and students from other health professions programs in the Duke School of Medicine.

Committee	Responsibilities	Faculty Members	Student Members
	 Design and implement 	Andolsek	Medical student (1)
	curricula	Carbrey	MBS student (2)
	Review evaluation data	Cullins	DPT, PA (1)
F	 Identify and prioritize 	Jackson	
Inr	revisions	Lee	
ricu	Recommend electives	Ossmann	
Cur		Ross	
0		Schmitt	
		Stinnett	
		Velkey	
		White	
It	 Guide implementation of 	Andolsek	MBS students (2)
ner	Communications Plan	Cullins	
litr	 Market program internally 	Jackson	
scr	and externally	Lee	
k Re	 Network with liaisons at 	Ross	
8 sı	other institutions	White	
tior	 Conduct site visits at other 		
icat	institutions		
unt	Liaison with Duke student		
μu	and faculty groups		
Col	Aid in creation of marketing		
	materials		
S	Finalize admissions policies	Andolsek	N/A
ŝuo	and procedures	Cullins	
issi	• Screen, review, interview	Jackson	
mp	and select candidates who	Lee	
A	will be offered admission	Schmitt	
		white	

Committee	Responsibilities	Faculty Members	Student Members
	Finalize policies for	Andolsek	N/A
	evaluating and monitoring	Bonner	
	student progress	Cullins	
	 Review assessment data on 	Jackson	
u	each student	Lee	
oti	 Ensure written and 	Ross	
шо	formative feedback to	White	
Pr	students		
	 Identify students with 		
	suboptimal performance		
	and link to appropriate		
	resources		
	 Finalize program evaluation 	Andolsek	MBS student (2)
c	and assessment plans	Lee	Medical student (1)
am tio	 Conduct annual program 	Others TBD	DPT student (1)
ogr Ilua	review	Faculty reps from DPT	Phys Assist student (1)
Pr Eva	 Prepare written report for 	and Physician Assistant	
	submission to SOM Masters		
	Oversight Committee		
	 Liaison with campus support 	Bonner	MBS students (2)
	services	Jackson	
	Participate in	Lee	
Life	orientation/onboarding	Ross	
int	planning		
Stude	 Motivate student 		
	participation in campus		
	student life		
	 Advise student activities 		
	committee		
Admissions Requirements

Applicants who are a good fit for the MBS will already be good candidates for admission to medical or to another health professions school. A baccalaureate degree from an accredited institution and most of the typical medical/health professional school prerequisites (e.g. one year each of biology and physics; two years chemistry to include inorganic and organic; sociology; psychology) must have been completed prior to matriculation.

To be considered for admission, a minimum GPA of 3.2 on all undergraduate and postbaccalaureate graded work is required. In addition to completion of the online application form, applicants will be required to provide transcripts, personal statements, responses to essay questions, letters of recommendation and to participate in a personal or video interview with a subset of the Admissions Committee, to include the Assistant Dean for Premedical Education.

The admissions process reflects that used currently to screen and admit applicants to our existing graduate level programs in the SOM. A program Admissions Committee, comprised largely of key faculty who teach in the program and are most familiar with the curriculum and expectations, will draw upon their professional expertise and experience with existing graduate level students in the SOM as well as with Duke premed students. They will review applications, interview, and rate applicants according to predetermined criteria.

Degree Requirements

The degree requires a total of 38 credits; of these, eleven courses comprise a required core curriculum of 33 credits. The remaining five credits are earned by completing one of two options for an individualized concentration: five credits of approved elective coursework or a mentored research/focused study or practicum project resulting in a written capstone paper for which five credits are awarded.

Students must complete 38 credits as follows:

11 required courses: (33 credits)

Human Structure (5) Enhanced EMT Training Course (4) Cellular Sciences (5) Systems Sciences (5) Medical Arts and Sciences Proseminar I, II, III (2 each for 3 semesters; 6 total) Medical Statistics (1) Discovery/Special Topics Journal Club I, II (2 each for two semesters; 4 total) Quality Measurement & Management (3)

Elective concentration: (5 credits)

Option 1: Research/focused study with capstone paper (5)Option 2: Selected coursework. With permission of instructor/department and adviser approval (5)

The two elective options will enable students to complete "concentrations" through elective coursework or a focused research project and paper. The program of study for the elective option will be determined contingent upon each student's intake assessment and identified needs and interests. An initial list of elective courses can be found in Appendix 6; letters from departments and teaching faculty are in Appendix 14.

Professional Training Requirements

One component of the proposed program entails meeting professional training requirements – the EMT-B (Emergency Medical Technician-Basic) training course. In order for the MBS students to become certified in the state of North Carolina and to perform duties as Emergency Medical Technicians, the following educational program requirements of the NC Office of Emergency Medical Services must be met: ⁷⁶

"1. The EMT program must be conducted by an approved Basic or Advanced Educational Institution as defined in the rules of the NC Medical Care Commission.

2. The lead instructor for the EMT educational program must be a NC credentialed Level I EMS Instructor at the EMT level or higher as defined in the rules of the NC Medical Care Commission.

3. The curriculum for the EMT educational program shall be the 1994 Release of the United States Department of Transportation (US DOT) National Highway Traffic Safety Administration NHTSA) EMT-Basic Course: National Standard Curriculum and the 2002 Supplemental Airway Modules for 1994 EMT-Basic: NSC.

4. The evaluation check sheets for verification of student independent-skill mastery shall meet the minimum criteria of those developed and maintained by the National Registry of Emergency Medical Technicians specific to the independent skills learned during each specific educational module.

5. The educational institution must maintain all student records that document:

a. Compliance with the student prerequisite of a high school diploma, general education development (GED) diploma, or reading comprehension on the tenth-grade level.

b. Any learning disabilities that may qualify the student for special consideration by the Office of EMS in the written credentialing examination.

c. Student attendance in the classroom, and any clinical and field internship components required of the educational program.

d. Successful completion of all components of the program, including written examination scores, independent-skills evaluation check sheets and scope-of-practice evaluation check sheets."

To ensure compliance with these professional training requirements, this component of the MBS curriculum is directed by Eric Ossmann, MD, FACEP. Dr. Ossmann is Director of Prehospital Medicine and the Duke Preparedness & Response Center, Vice-Chief and Associate Professor, Division of Emergency Medicine, Associate Chief Medical Officer, Duke University Health System and Medical Director of Duke EMS. As the EMT-B Course Director and member of the MBS Curriculum and Advisory Committees, Dr. Ossmann leads the development and implementation of our EMT curriculum, the development of clinical correlates for the Human Structure course, and the identification and supervision of the certified instructors for the EMT-B course.

In addition to Dr. Ossmann's leadership, curriculum consultation is provided by Dr. Thomas Blackwell of the University of South Carolina School of Medicine – Greenville, who directs one of only two EMT training programs required for first year medical students at a US medical school.

Assessments

Degree requirements do not include a comprehensive final assessment such as a comprehensive written/oral examination or required thesis. However, a comprehensive written narrative report regarding student performance, similar to the "Dean's Letter" prepared by Duke medical students' Advisory Deans, will be prepared for each student.

Accreditation

Beyond Duke University's institutional accreditation by the Southern Association of Colleges and Schools, there is no external accreditation applicable to the MBS. Many School of Medicine programs have an external accreditation body that requires periodic self-study and provides oversight (e.g., Liaison Committee for Medical Education for the medical student program; National Accrediting Agency for Clinical Laboratory Sciences for the pathologist assistant program). For those programs that do not have such external accreditations, the School of Medicine Masters Oversight Committee (MOC) has been established to provide ongoing educational oversight. Chaired by the Director of Assessment for the SOM, the committee consists of senior leaders from each of the pertinent degree programs and a subset of representatives from the SOM programs that are externally accredited. Additional members include leadership from Duke AHEAD (Academy for Health Professions Education and Academic Development), and the Office of Diversity and Inclusion.

Plans for Compensating Faculty and Role in APT

As mentioned earlier and described more fully in Section K, Financial Considerations, support for faculty effort devoted to the development and implementation of the MBS is proceeding in two phases: program and course development (FY14 and FY15) and program implementation (starting in FY16). The current developmental phase is supported through SOM reserves. Faculty compensation during the program's implementation phase will be in keeping with the School of Medicine's existing financial model for supporting educational effort in described more fully in Section K.

As described earlier in this section, letters of appointment from the Assistant Dean for Premedical Education will detail each of our faculty's expected roles, effort and compensation as well as the annual evaluation process. In addition, as appropriate pending individual status with regards to AP&T, the letters will include confirmation of progress toward expected promotion and/or other milestones. A letter summarizing an annual review will be provided to each faculty member's division/department chair.

Administrative Structure

Administrative, curricular, and operational oversight of the MBS will be directed by an Executive Committee, consisting of the Program Director, Associate Program Directors for IHBS and Medical Arts & Sciences, and the Assistant Dean for Premedical Education.

Roles of Key Leaders

Assistant Dean for Premedical Education: Kathryn M. Andolsek, MD, MPH

Dr. Kathryn Andolsek provides senior academic leadership and oversight of the program, and is directly accountable to the Vice Dean for Education, Edward G. Buckley, MD. Dr. Andolsek's primary responsibilities include representing the MBS on SOM and University level committees; serving as primary liaison with partnering entities at the University including, but not limited to, the Office of Health Professions Advising and Center for Career Services; identifying and recruiting key faculty and other program leadership; advocating for needed resources; networking with national colleagues; enhancing visibility of the MBS within the Duke community and nationally; identifying opportunities for scholarship; directing the continuous quality improvement process; guiding recruitment and admission of a high quality and diverse student population; advising students; teaching select courses and co-leading proseminar small groups; and leading/co-leading program committees as described elsewhere.

Program Director: Linda S. Lee, Ph.D.

Dr. Lee will be the Program Director for the Master of Biomedical Sciences degree program, and as such will be responsible for working with other SOM faculty and administrators to create and supervise the program. Specific responsibilities include but are not limited to developing an appropriate curriculum and recruiting faculty to participate, developing a strategic planning process including the identification and acquisition of needed resources, overseeing the creation and application of the admission process, establishing student counseling and career planning services, conducting pedagogical research assessing program outcomes, monitoring student progress toward the degree, overseeing course and program evaluation process, overseeing development and maintenance of program records, supervising program staff, and obtaining and maintaining the necessary approvals for the degree.

Associate Program Director for Integrated Human Biological Sciences: Leonard E. White, Ph.D.

Dr. White will be the Associate Director for IHBS and serve on the Executive Committee of the MBS. He will coordinate the development of the IHBS curriculum, working closely with Dr. Jackson on the integration of all aspects of the core curriculum. He will be responsible for identifying and supporting course directors that will employ a team based learning format. He will convey student feedback to the course directors for their use in refining the content and the instructional strategies, serve as an instructor for selected content in the IHBS courses, participate on the Curriculum, Recruitment, Admissions, Promotion and Program Evaluation committees, and advise a subset of students with an emphasis on those who graduated from Duke University.

Associate Program Director for Medical Arts & Sciences: Joseph A. Jackson, M.D.

Dr. Jackson will be the Associate Director for Medical Arts and Sciences and serve on the Executive Program Committee. He will work with a team of faculty to design and implement the required core Medical Arts and Sciences proseminar courses and serve as co-course director. He will work closely with Dr. Eric Ossmann, who will direct the Enhanced EMT Course curriculum to ensure its integration with the IHBBS courses, and is reformatted to a team based learning format, and will collaborate with Dr. White to

ensure curriculum integration. He will convey student feedback to the course directors for their use in refining the content and the instructional strategies, serve as co-course director for Discovery/ Journal Club, and as an advisor to a subset of students. He will also serve on the Curriculum, Recruitment, Admissions, Promotion and Program Evaluation committees.

Owning and Contributing Duke Entities

Duke University School of Medicine is the sole owning and contributing entity for this program.

G. Comparison with Existing Programs

Our due diligence in evaluating comparable competitive programs at other institutions led to the discovery that a broad array of programs of various types is in place at a number of institutions. For example, the Association of American Medical Colleges (AAMC) website now lists a total of 157 post-baccalaureate programs of all types (undergraduate, graduate, certificate and degree) at 123 institutions.³ In addition, a number of institutions have unadvertised "in-house" programs to which promising but borderline admitted medical school applicants, typically from underrepresented, disadvantaged, or first generation college student populations, are directed to strengthen their academic performance prior to matriculation at that particular school.

The original Advisory Committee, convened in 2011 by Dona Chikaraishi, Associate Dean for Biomedical Graduate Education and Leadership Services, to explore the potential and viability of such a program (see Appendix 5: Initial Professional Master's Advisory Committee and Appendix 7: Program Development Timeline) engaged the services of a Fuqua Small Business Consulting Team to conduct a feasibility study in 2012. The Consulting Team conducted and reported on four analyses: environment, market, competition, and SWOT (strengths, weaknesses, opportunities, and threats).^{67,68} A review of potential competing programs, specifically those offered by top schools of medicine, revealed that most programs offered by our peers (See Appendix 8: Peer Institutions for program comparisons) are certificate, rather than degree programs; that most programs were developed in the spirit of the true "post-bac" programs described earlier designed to remediate deficiencies in academic preparation through completion of prerequisite science courses; and that degree programs typically centered on one biomedical science such as physiology or anatomy.

Given the variability in program offerings, duration, culminating credentials, types of sponsoring institutions, and target audiences, the Consulting Team applied the following criteria to identify existing programs against which Duke's MBS would most likely compete directly for students.

- Program is offered by a *medical school*.
- Program includes multiple subjects representative of medical school's preclinical science curriculum.
- Program culminates in awarding of a master's degree.

Thirty programs listed on AAMC's website met these criteria of direct competitors at the time the report was prepared. For further detailed analysis, five programs based on either

geographic proximity to Duke or the reputation of the medical school with which the program was affiliated in *US News & World Report* were selected. These schools were Boston University, Georgetown, Tulane, University of Michigan and New York Medical College. We have added to this list of potential competitors Wake Forest University's newly revised Master of Biomedical Sciences program, noted earlier in this proposal. In addition, due to geographic proximity, reputation and ranking as a peer institution, and its recent entry into the field of play (as noted earlier), we include the Johns Hopkins University Health Science Intensive program, offered through Hopkins' School of Arts & Sciences.

A detailed analysis of these key competitors plus Hopkins and the Wake Forest program revealed the following commonalities:

- Programs are on-campus, not online
- Generally require at least two full semesters plus a month or summer term (11-12 months)
- Tuition range: \$21,000 to \$48,000
- Minimum GPA = 3.0; average GPA of recent entering classes slightly higher
- Minimum MCAT score if required = 25; most 28-30
- Tulane, Michigan, Wake Forest and NY Medical College offer several tracks/paths, including a research path
- Medical school faculty teaches some, if not all, coursework.
- Some coursework is taken with matriculated medical students in medical school curriculum
- Generally, neither an interview nor admission to program's home medical school is guaranteed.
- Truly unique curriculum components are limited to Tulane, which offers gross anatomy with full cadaveric (vs. prosections) dissection, and Hopkins, which includes required coursework in professional communication, teamwork in health care, and psychosocial dimensions of health and the "art" of providing care.

One of the most striking characteristics of many of these programs, however, is the lack of scholarship assistance (beyond standard financial aid and loan programs) available for the degree-granting programs in our competitive pool. In keeping with Duke SOM practice, we are prepared to devote 15% of our tuition revenue to student scholarships, with the intent to increase that percentage in the future once the program establishes financial stability.

We believe that the program we propose will be highly desirable to potential students and well positioned to compete successfully for the best candidates. The table following compares components of our MBS program with those of other programs in the field.

Component	Duke MBS component	Typical post-baccalaureate
		program
Anatomy instruction	Gross anatomy with cadaveric	Generally not included. When
	dissection laboratory integrated	offered, the courses are lecture
	with other biological sciences and	based. If labs are included,
	the EMT curriculum.	prosections or computer
		simulations are used.
Patient care	EMT training, certification, and	Shadowing clinicians; "observation"
experience	experience on community EMS	only. Often optional.
	squads; identity and practice as a	
	member of the health care team	
	rather than as an observer	
Pedagogical approach	Team-Based Learning.	Lecture-based, instructor centered
	Small group proseminars	
	Electives allow some	
	customization to meet individual	
	goals and needs	
Program home	School of Medicine	Arts & sciences, graduate school or
		continuing studies
Curriculum focus	Graduate level curriculum	Students typically added to existing
	developed for and dedicated to	graduate and/or first year medical
	MBS students.	school courses
Curriculum structure	Integrated and interdisciplinary	Discipline-based
Biological sciences	Integrated biological sciences	Discrete discipline-based courses
academic program	curriculum and faculty	
Student program of	Core requirements plus	Medical school prerequisites or first
study	individualized elective program	year medical school courses
Scholarship funds	Funds dedicated and budgeted	Program scholarships unavailable

In addition, the MBS will offer a "pre-matriculation" advising option for students who wish to concurrently apply to a health professions school with the MBS. The following figure outlines the medical school application process, typical in timing to other health professions schools.



We will work with students who pursue this option following their acceptance and registration. During, April-June, Dr. Andolsek and her team will provide individualized mentoring based upon the specific needs of the student. This may include coaching on various aspects of the application process, strategically selecting schools, establishing timelines, editing applications, personal statements, resumes and essays, and selecting appropriate individuals for the required letters of recommendation. The AAMC On-line application service, used by all medical schools, opens in early May, accepts submissions in early June, and electronically transmits materials to medical schools at the end of June. Schools then send "secondary essays" which aren't due until the fall, with interviews occurring September to February. Once students matriculate to the MBS on June 29, 2015, their advising will occur as a core component of the curriculum. The small cohort of students, the close working relationships between students and faculty, and the dedicated advising system will allow sufficient contact time to help them continue to build their resumes, respond to requests for secondary essays, and later to practice in standardized workshops a variety of commonly employed interviewing techniques. Course grades and narratives comments will be available from the first two semesters of the MBS for health professional schools to use in their admission decisions, which are made in March-April.

For students who plan to apply to health professional schools the year following the MBS, the program will help them identify appropriate activities for their "gap year' and continue to work with them on their application process. The assistance with applications will continue for up to 3 years following graduation.

H. Curriculum Considerations

Overview of Curriculum and Program Structure

As noted throughout this proposal, we aim to prepare "the next generation of professional…leaders" ⁶⁹ by educating and mentoring individuals who will be highly competitive candidates for schools of medicine and related biomedical/health science careers. We will do this by providing the best combination of academic preparation, direct patient-care and service-learning experiences, advising, and professional development activities.

In keeping with this mission and with the Program's stated values and guiding principles as articulated by the Curriculum Committee (Appendix 2), we designed a full time 38 credit curriculum that includes the following: coursework adapted from Duke's first year medical school, physical therapist and physician assistant curricula; an intense team-based patient-centered service learning experience through training, certification, and service as an Emergency Medical Technician; instruction and guided practice in selected professional and lifelong learning skills fundamental to competencies in the health professions; an individualized elective concentration; and a structured longitudinal pre-medical/prehealth advising component.

Coursework in the biomedical disciplines of cell biology, histology/microanatomy, immunology, neurology, and physiology – integrated in a manner similar to Duke's unique first year curriculum - will comprise the human biological sciences core of the program in the Cellular Sciences and Systems Sciences courses. In addition, students will complete an immersive lab-based gross anatomy course, Human Structure, that includes cadaveric dissection and surface anatomy (palpation). Instruction in gross anatomy has been shown to aid in the development of professionalism and a patient-centered approach to care, and, for those students who complete lab-based anatomy prior to medical school, to lead to better performance in medical school anatomy than those without it.^{46,77-79} This course will be planned and integrated in conjunction with the EMT training course to deepen knowledge of specific body structures and to enhance the introduction of professional attitudes and skills.⁷⁹ This course is one of the features that distinguish our program from that of other SMPs.

The professional development component, which will be integrated throughout each term of the program, will include explicit instruction in bioethics through case studies, guided practice and feedback in critical reflection, self- and peer-assessment, inter-professional communication, teamwork, and interviewing skills. The professional development component is designed in keeping with the "Reference List of General Physician Competencies" which articulates eight competency domains for **all health professionals.**⁴⁴

Our curriculum has been derived from these domains and the faculty are collaborating to select relevant content, teaching strategies and assessment activities to reflect each of these. Although it is not our aim to achieve the physicians' (or other health professionals') entry-level competency in each of these areas upon completion of the MBS curriculum, we do aim to provide a comprehensive foundation for building competence in each of the eight domains.

Curricular	Pedagogical	Integrated	Medical arts &	EMT training	Individualized	Advising
Component	approach -	human	sciences	and clinicals	elective	
	TBL	biological	proseminars		component	
		sciences				
Domain		courses				
Patient care			V	v	V	
Knowledge for		v		v	V	
practice						
Practice-based	v		V	v		V
learning &						
improvement						
Interpersonal &	V	V	V	V	V	V
communication						
skills						
Professionalism	v	v	v	v	V	
Systems-based			V	V	V	
practice						
Interprofessional	v		V	V		
collaboration						
Personal &	V		V	V	V	V
professional						
development						

The list of competencies provides the framework for building our curricula, a guide for mapping when and how our learners are instructed and learn, and the key to developing robust assessments that document their observed performance.

Each student will be assigned to a faculty adviser (See Section N) who will participate in the student's onboarding activities and intake assessment process, guide the development of the student's required Action Plan, and in partnership with the assigned OHPA adviser, provide academic guidance throughout the program, including approval of the student's options for the elective component of the program. Students accepted into the MBS who plan to apply to medical or another health professions school will be offered a pre-matriculation advising option to ensure that those students understand the application process and are on track to prepare for the various application deadlines during their program of study.

The 38-credit curriculum, presented in the table following, includes 11 required core courses (33 credits) and an elective component in which students may complete either 5 credits of approved elective coursework or a faculty-mentored research/focused study project resulting in a written capstone paper for which 5 credits are awarded.

Core (required) component	Elective component
Human Structure (5)	Option 1: Mentored research focused project/study and
Cellular Sciences (5)	capstone paper
Systems Sciences (5)	
Enhanced EMT-B (4)	Option 2: Approved coursework - examples
Medical Arts & Sciences	(Full listing is in Appendix 6; program/instructor letters in
Proseminars (6)	Appendix 14)
Medical Statistics (1)	Evidence-Based Medicine (2)
Quality Measurement &	Practical Clinical Nutrition (2)
Management (3)	Health Care Organization and Policy (3)
Discovery/Current	Medical Spanish (2)
Topics/Journal Club (4)	Exploring Medicine in Other Cultures (1)
	Evolution of Bioethics in the 20 th Century (1)
	Medical Genetics (2)
	Molecular Biology Techniques (2)
	Proteomics and Protein Biology in Medicine (2)
	Responsible Conduct of Research (2)
	Fundamentals of Health Care Finance (4)
	Informatics for Clinicians (3)
	History of Pub. Health & Epidemic Disease in America (2)
	Feast or Famine: Food in Global History (2)

As our program is a one-year degree program, each of the Core (required) courses will be offered annually on the following schedule:

- MBS Term I (summer)
 - o Human Structure (5)
 - Enhanced EMT-B (continuation credit)
 - Medical Arts & Sciences Proseminar I (2)
- MBS Term II (fall)
 - Cellular Sciences (5)
 - Enhanced EMT-B (continuation credit)
 - Medical Arts & Sciences Proseminar II (2)

- Discovery/Current Topics/Journal Club I (2)
- Medical Statistics (1)
- MBS Term I (spring)
 - Systems Sciences (5)
 - Enhanced EMT-B (4; grade assigned upon completion of clinicals)
 - Quality Measurement & Management (3)
 - Discovery/Current Topics/Journal Club II (2)
 - Medical Arts & Sciences Proseminar II (2)

The student time commitment is estimated to be, on average, 20-22 hours per week of "programmed" activity and 38-40 hours per week of preparation and study for a total effort for success in the program of approximately 60 hours per week.

MBS Term I		MBS	5 Term II		MBS Term III					
Jul Aug	Sept	Oct	Nov	Dec	Jan Feb Mar Apr M					
Human Structure (5)		Cellular Sciences (5)				Systems Sciences (5)				
EMT-B T	raining 8	ç.	EMT	EMT	EMT	EMT	EMT	EMT	EMT	
Certific	ation (4)		clinical	clinical	clinical	clinical	clinical	clinical	clinical	
Medical Arts & Sciences Proseminar I (2)	M	Medical Arts & Sciences Proseminar II (2)			Medical Arts & Sciences III Proseminar (2)			nar (2)		
		Medical Statistics (1)			Quality N	Measurem	ient & Mai	nagement	(3)	
	Discov Topics	Discovery/Current				y/Current	Topics/Jo	urnal Club) II (2)	
No electives MBS Term I	Elective component: Option 1: Research/focused study- 2 semesters ("mini-thesis" – complete by graduation) (5) or Option 2: Approved graded coursework (5)									

Prototypical program of study

We provide here an example of two prototypical students, "Odeara," and "Sam" and what their recommended programs of study would be.

Odeara: Odeara is a graduating college senior aiming for admission to medical school. Her "academics" are excellent: a 3.75 in prerequisite sciences including biochemistry, organic chemistry, biology, and physics. She completed an optional capstone research project her senior year which earned an Honors designation by her senior committee. Her volunteer

resume includes leading several service projects sponsored by her church. As strong as her credentials appear to be, other than volunteering as a visitor guide at her local hospital, she lacks first hand clinical patient exposure.

Odeara's EMT coursework, certification and clinical experience will provide her with a genuine practice experience as a "real" member of the health care team. Most students have only observer or shadowing experiences. Odeara will be an active participant in in the care of patients. She will be involved in a variety of acute and chronic conditions, work with other health care team members, learning about their roles, and understanding the critical importance of access, socioeconomic status, and health care determinants in the quality of patient outcomes.

Odeara will complete Elective Option 2 through an elective experience modeled on current Duke medical and Physician Assistant student community health projects. Her Community Engagement elective/practicum will include completion of graduate level coursework in population health through Duke's nationally recognized Population Health Improvement Teams (PHIT) curriculum, developed in part with collaboration with the Centers for Disease Control and the AAMC.^{80,81} A concurrent longitudinal immersive mentored experience within a community health team will allow her to apply the skills she is learning to a project within the Durham community.

MBS Term	erm I MBS Term II MBS Term III								
Jul Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Human Structure (5	re (5) Cellular Sciences (5)			Systems Sciences (5)					
EMT-B	Training 8	&	EMT	EMT	EMT	EMT	EMT	EMT	EMT
Certif	cation (4)		clinical	clinical	clinical	clinical	clinical	clinical	clinical
Medical Art & Sciences Proseminar (2)	S M	Medical Arts & Sciences Proseminar II (2)			Medical Arts & Sciences III Proseminar (2)				nar (2)
		Medical Statistics (1)			CLP 206 (3)	Quality M	easureme	nt & Mana	agement
	Discov Topics	Discovery/Current Topics/Journal Club I (2)				y/Current	Topics/Jo	urnal Club	ll (2)
No electives MBS Term I	Electiv Optior level s comm	Elective component: Option 1: A two semester Community Engagement project that blends graduate level study in population health with an immersive mentored experience in a community agency, culminating in a written report and poster presentation. (5)						aduate in a on. (5)	

Odeara's program of study would look like this:

Sam: Sam is a graduating college senior aiming for admission to medical school. His "academics" are excellent: a 3.75 in prerequisite sciences including biochemistry, organic chemistry, biology, and physics. Like Odeara, he completed an optional capstone research project his senior year which earned an Honors grade. His community service resume is exceptionally strong – he volunteered with Special Olympics in high school and college and for the last two years has volunteered four hours per week during the school year in the pediatrics waiting room at the local community health center. During summer breaks he worked as a counselor in summer camps for children with special needs. His experiences with Special Olympics, the community health center and summer camp piqued his interest in pediatrics with plans ultimately to work in the area of genetics research.

Sam will complete Elective Option 1, by taking approved elective coursework in the Clinical Research Training Program: Introduction to Medical Genetics and Responsible Conduct of Clinical Research. These courses will enable Sam to explore the area of genetics in more depth than through his undergraduate work, to learn more about the proper conduct of clinical research and the ethical challenges confronting investigators, and to develop relationships and learn from physicians actively engaged in clinical research.

MBS Term I		I MBS Term II MBS Term III				III				
Jul /	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Human Structure	Human Structure (5)Cellular Sciences (5)Systems Sciences (5)			Cellular Sciences (5)			es (5)			
EM Ce	EMT-B Training &EMTEMTEMTEMTEMTEMTCertification (4)clinicalclinicalclinicalclinicalclinicalclinical			raining & EMT EMT ation (4) clinical clinical			EMT clinical			
Medical & Scien Prosemin (2)	Arts Ices nar I	Medical Arts & Sciences Proseminar II (2)			Medical Arts & Sciences III Proseminar (2)					
		Medical Statistics (1)			CLP 206 (3)	Quality M	easureme	nt & Mana	agement	
		Discovery/Current Topics/Journal Club I (2)			Discover	y/Current	Topics/Jo	urnal Club	ll (2)	
No electi MBS Terr	ives m I	Elective component: Option 2: Introduction to Medical Genetics – Fall term; Responsible Conduct of Research – Spring Term.								

Sam's program of study would look like this:

New Courses to Be Developed

The Curriculum Committee (Appendix 3) is currently developing the new courses required for this curriculum. The faculty who lead development and implementation of each of the Core (required) courses are: (See Appendix 15 for curricula vitae)

Core (required) Course	Course Director
Human Structure	Daniel Schmitt PhD
Cellular Sciences	Jennifer Carbrey PhD
Systems Sciences	Matthew Velkey PhD
Medical Arts and Sciences Proseminars I, II, and III	Elizabeth Ross DPT / Joseph Jackson MD
Discovery/Current Topics/Journal Club I, II	Joseph Jackson, MD
EMT Training/Certification	Eric Ossmann, MD/Steven Barmach, MD

The new courses under development are:

Human Structure

The fundamental goal of this course is to provide an anatomical framework for understanding the form and function of the normal human body. In pursuing that goal, this course will expose students to principles that define critical thinking within the basic sciences. The knowledge students develop about anatomical relationships and structure and function can then be applied to problems of dysfunction that are relevant to clinical practice providing the foundation for success in other courses and in future studies. This goal will be achieved through a variety of team-centered and learner-focused experiences, including direct, active dissection of human cadavers, learner-centered investigation of intact and prosected human brain specimens, classroom presentation and discussion, and team-based learning activities. The team-based learning activities will emphasize applications that connect the dissection and didactic experience to larger problems in functional and clinical anatomy. With these goals in mind, the central theme of the course is gross human anatomy and the relationships between the musculoskeletal, neurological, and vascular systems of the human body. These relationships will be explored by dissection, examination, and integrative investigations of the morphology and function of the axial skeleton, upper and lower limbs, the central and peripheral nervous systems, and cardiac, pulmonary, gastrointestinal, urogenital and reproductive systems. This process will involve the instructional staff for gross anatomy in all aspects of the course, as well as course leaders from other courses in the Masters of Biomedical Sciences curriculum. The broader participation of program faculty will help integrate course content with larger curricular goals and objectives, including those pertaining to the medical arts and sciences—a unique feature of this approach that is typically absent from a traditional undergraduate course on human anatomy. Thus, this course will include a focus on the surface anatomy of the intact (living) human body and the palpation skills necessary to locate important bony landmarks, joint spaces, muscles, ligaments, bursae, nerves, and vessels as well as the anatomical correlates of many clinical procedures including venipuncture, tracheotomy, and fractures or joint displacement reduction. These areas highlight key aspects of human functional anatomy as they pertain to clinical practice and are critical for training and practice as emergency medical technicians (EMT). Therefore, content sequence and clinical correlations with the concurrent EMT-B course will be emphasized. Mode of instruction for this course will utilize the principles and practices of team-based learning, with students organized in small teams for readiness assurances, integrative team applications and guided discovery in laboratory experiences.

Cellular Sciences

The goal of this course is to build a basic understanding of the molecular and cellular principles of tissue organization, organ function, and human disease. The course will include a survey of several perspectives on cellular sciences, including biochemistry, cell biology, cellular physiology, genetics, immunology, pharmacology, microanatomy, and the basic mechanisms of pathology. The integration of this content will emphasize the structure and function of the cells and tissues of the body, the relationships among the major classes of macromolecules in cellular systems, metabolic control mechanisms, and the biochemical basis of human diseases. A laboratory component provides an interactive experience using virtual microscopy to analyze the structure of normal and pathological cells and tissues. Mode of instruction for this course will utilize the principles and practices of team-based learning, with students organized in small teams for readiness assurances, integrative team applications and clinical correlations.

Systems Sciences

The goal of this course is to develop a conceptual model for understanding the physiology of major organ systems in the body, building upon the integration of human structure and cellular sciences. The focus of this course will be on the integrated function of organ systems in regulating the overall homeostasis of the human body, as well as the pathophysiological response of organ systems to injury and disease. The course will feature laboratory exercises, clinical correlations, and active learning experiences that incorporate exploration and dissection of fresh (non-preserved) human structures and non-human tissues. Mode of instruction will implement the principles and practices of team-based learning, with students organized in small teams for readiness assurances and integrative team applications.

Medical Arts and Sciences Proseminar I, II and III.

This 3-semester longitudinal course is designed to enhance understanding of the meaning of illness, and the development of personal identity and professional formation in the aspiring health professional. Through training and practice as EMTs and regular small group seminars with mentoring faculty and advisers, the course stresses active learning in a supportive environment. Students will develop a core set of skills including improved insight and self-awareness, effective verbal and written communication, cultural humility, self-reflection and practice giving and receiving feedback. They will demonstrate self-care and resiliency, practice conflict management and critical conversations, explore career alternatives, practice interviewing.

Enhanced EMT-Basic Training Course.

This course is designed to instruct a student to the level of Emergency Medical Technician-Basic (EMT-B), and will be concurrent with and supplemented by correlated content in the Human Structure and Cellular Sciences courses. The EMT-B serves as a vital link in the chain of the healthcare team. It is recognized that the majority of pre-hospital emergency medical care will be provided by the EMT-Basic. This includes all skills necessary for the individual to provide emergency medical care at a basic life support level with an ambulance service or other specialized service. Specifically, after successful completion of the course, the student will be capable of performing the following functions at the minimum entry level: recognize the nature and seriousness of the patient's condition or extent of injuries to assess requirements for emergency medical care; administer appropriate emergency medical care based on assessment findings of the patient's condition; lift, move, position and otherwise handle the patient to minimize discomfort and prevent further injury; and, perform safely and effectively the expectations of the job description. Mode of instruction will implement the principles and practices of teambased learning, with students organized in small teams for readiness assurances and integrative team applications.

Discovery/Current Topics/Journal Club I and II

The course will consist of introductory skills in searching, critically reading and interpreting the medical literature. Students will learn how to construct appropriate clinical questions to discover answers to challenging patient situations. The course will feature outside speakers who will provide expertise on current topics in medicine and health care delivery followed by interactive large and small group exercises.

Existing Courses

Medical Statistics and Quality Measurement and Management are graduate courses which currently exist within the School of Medicine, and are described in the *Bulletin of the School of Medicine* as follows:

Medical Statistics. This course covers in-depth statistical concepts that will be used by [medical] students during their third year research projects.

Quality Measurement and Management. The course provides a survey of all related aspects of quality management including a review of HEDIS, NCQA, JCAHO structures and guidelines. Special emphasis is placed on outcomes, clinical guidelines, evidence-based medicine, disease management, interdisciplinary team care, CQI/TQM, role of purchaser, and patient satisfaction.

MBS Term I -Summer 2015							
June 26-27	Orientation						
June 29 - Monday	First class day						
July 3 - Friday	Independence Day Holiday; no classes*						
July 6 - Monday	Classes resume						
August 7 – Friday [?]	AOA Day – mandatory attendance						
August 28 - Friday	Last class day in Program Term I						
August 31 - Monday	Team Seminar Day						
MB	S Term II – Fall 2015						
September 1 - Tuesday	Term II classes begin						
September 7 - Monday	Labor Day Holiday; no classes*						
September 8 - Tuesday	Classes resume						
Date TBD	Basic Science Day – mandatory						
attendance							
Date TBD	Clinical Science Day – mandatory						
attendance							
November 24 - 27	Thanksgiving Broak - no classos*						
Tuesday - Friday							
November 30 - Monday	Classes resume						
December 18 - Friday	Last class day in Program Term II						
Monday, December 21,							
2015 – Friday, January	Winter Holiday Break – no classes						
4, 2016							
ME	3S Term III – Spring 2016						
January 4 - Monday	Term III classes begin						
January 18 - Monday	Martin Luther King, Jr. Holiday; no						
	classes*						
January 19 - Tuesday	Classes resume.						
March 1418	Spring Break; no classes*						
March 21	Classes resume						
May 7 - Saturday	Term III classes end. *						
May 13 - Friday	Commencement begins						
May 15 - Sunday	Graduation Exercises						

*Note: Students are expected to attend assigned/scheduled clinical and service learning activities even when scheduled on non-class days e.g. holidays, breaks, weekends.

I. Professional Components, Accreditation, Assessment

Professional certification

The only professional requirement associated with the program will be EMT-Basic certification achieved by successful performance in the Enhanced EMT-B Training described earlier (Section F - Professional Training Requirements). Students will undergo continued evaluation as they complete the associated clinical requirement (minimum one 12 hour EMS shift per month; a minimum of seven such shifts prior to graduation). Evaluations will include self-assessments, peer assessments, and assessment by EMS shift supervisors, under the direction of Dr. Eric Ossmann. In addition to Dr. Ossmann, who directs the Enhanced EMT-B Training course, Dr. Thomas Blackwell at the University of South Carolina School of Medicine – Greenville is serving as a consultant. Dr. Blackwell directs one of only two EMT training programs required for first year medical students at a US medical school.

Program Accreditation

As noted earlier the MBS program is not subject to external accreditation beyond institutional accreditation by the Southern Association of Colleges and Schools.

Program Evaluation and Assessment of Student Learning Outcomes

The MBS leadership is committed to a robust process of continuous quality improvement, continuing a process that began with the initial needs assessment for the program. As noted earlier, the needs assessment and initial planning included a market analysis, a review of the literature, key informant interviews, reviews of existing post baccalaureate premedical programs with an emphasis on Special Masters Programs, and exploration/discussion by the Chancellor's Enterprise Wide Planning Group.

Program evaluation.

Our overall *program evaluation* goal is to evaluate program performance in terms of impact on student career progression, program quality, program participation, and program reach. Our *assessment of student learning outcomes* will focus on our students' demonstration of knowledge, skills and attitudes representative of each of the health professions competency domains described earlier (Section H – Curriculum Considerations). Program evaluation and student outcomes data will be reported to and reviewed on a regular basis by the MBS Advisory Committee and the Vice Dean for Medical Education, and annually in the form of a self-study to the School of Medicine Masters Oversight Committee. The data and self-study will be used to gauge progress toward program goals as well as to guide management decisions regarding problems and needed interventions, program changes, and prioritization of effort.

At the institutional level, the MBS will provide student learning outcomes assessment data through the School of Medicine's annual reporting process to meet the requirements of the University's accrediting body, the Southern Association of Colleges & Schools Commission on Colleges. In addition, the program will be subject to external review by the University after three years (2018) and then every 5-6 years per the policy proposed by the Masters Advisory Council, adopted, and disseminated in October of 2013 by the University Provost.

Following is additional detail regarding our program evaluation and learning assessment plans.

Program evaluation

As stated in the introduction to this section, we aim to evaluate overall program performance in the following areas:

- Impact on student career progression
- Program quality
- Program participation
- Program reach

Primary Goals and Data Sources for Program Evaluation					
Evaluation Goal	Data Sources	Metrics			
Monitoring	Incoming and exiting student surveys	Change in career interests, perceptions			
student career progressions and biomedical competence.	Alumni surveys	Health professions school matriculation, employment, career trajectory			
	Retrospective pre-post self assessments	Self-reported changes in biomedical competence			
	Pre-post mentor, advisor, and EMT supervisor assessments	Improvement in ratings by mentors, advisors, and supervisors; demonstration of competence			
	Readiness assurances within courses	Student engagement, preparation, and acquisition of biomedical concepts.			

	Final course grades	Progress toward degree completion.
Assessing program	Non-matriculants survey	Competitive factors and reputation
performance (quality, participation, and reach)	Surveys of medical/health professions schools to which MBS graduates matriculate.	Level of our graduates' performance as compared to graduates of other programs.
	Course/activity evaluations by participants	Quality of didactic experiences
	Student/trainee database (characteristics of applicants, matriculants, course enrollments)	Diversity Geographic distribution Quality Course/activity enrollment levels
	Faculty focus groups Exiting student surveys/interviews and alumni	Quality of trainees Attainment of trainee educational and professional goals
	Advisory committee	Degree of alignment with overall program goals
	Website analytics	Online hits, geographic distribution of inquiries, duration of interaction, pages downloaded, etc.
	Revenues and expenditures	Program financial viability and sustainability
	Requests for and establishment of linkages with medical and other health professions schools and employers	Overall program quality and graduate performance
	Scholars@Duke; LinkedIn	Faculty promotions, recognitions, scholarship and external invitations.

In a manner similar to that used with Duke Medicine's 80 plus graduate medical education programs (residencies and fellowships), the MBS will constitute a Program Evaluation Committee to oversee a yearly self-study. This self-study will incorporate the evaluation data outlined above, and will inform the program's improvement plan in a manner consistent with evidence-based quality improvement practices as shown in the examples following.

Examples of how collected data will be used to inform our program's evidence-based quality improvement process include, but are not limited to, the following:

- 1. Applicants who are accepted and choose not to matriculate will be surveyed regarding their reasons for non-matriculation and information regarding their future plans or chosen post-baccalaureate program. The data will enable us to identify competitors and any problems with our recruiting and admissions processes or systems.
- Results of student course evaluations will be reported to the relevant course directors and instructors, and will be reviewed during the annual faculty conferences with the Vice Dean for Premedical Education as described in Section F

 Program Structure. The data will also be reported in a format that can be included in reviews for appointment, promotion, and tenure.
- 3. Characteristics of our student population will be tracked including the demographics of students who apply, matriculate and graduate. In addition to the required annual institutional reporting for Integrated Postsecondary Educational Data System (IPEDS), the data will be reported annually to and reviewed by the MBS Advisory and Admissions Committees to monitor the diversity and quality of the student pool and to inform recruiting and admissions practices.
- 4. Graduate outcomes will be tracked including the number of graduates who apply to health professions schools, acceptances, matriculations, and future training programs (such as residency training and other professional plans). Schools accepting our graduates will be surveyed regarding our graduates' performance. These data will be reviewed annually by the MBS Advisory Committee and the Masters Oversight Committee (described later in this section) to monitor achievement of program goals and to identify potential gaps in the curriculum or advising structure. In addition, the data will be included in required reporting to the Southern Association of Colleges and Schools on student outcomes.
- The annual program evaluation and improvement plan will be submitted to the School of Medicine Masters' Oversight Committee, described later in this section. This Committee will ensure that lessons learned and best practices are shared across SOM programs.

Assessment of learning outcomes.

Proposed student learning outcomes for initial SACS reporting upon conclusion of Year One of the program pending review and approval by the MBS Program Evaluation Committee are:

Outcome	Measure & Target	Finding	Resultant Action
Students complete	90% students in		
degree	Cohort One graduate		
requirements.	on time.		
Students matriculate	75% of students in		
to medical or health	Cohort One who		
professions school.	apply to		
	medical/health		
	professions school so		
	matriculate within		
	two years of		
	graduation.		
Non-med school	90% graduates who		
applicants enter	do not matriculate to		
alternative career	medical/health		
path.	professions school		
	enter full-time		
	employment in		
	related field within		
	six months of		
	graduation.		
MBS graduates who	80% of responding		
matriculate to	medical schools will		
medical school will	indicate "often" or		
perform favorably in	"always" in response		
their first two years	to survey question:		
of medical school in	"This Duke MBS		
comparison to	graduate performed		
graduates of other	as well or better		
programs.	than other		
	matriculants."		

Our preliminary plan for data collection and reporting on these outcomes, pending review by our Program Evaluation Committee, follows:

Outcome	Data	Data Source	Frequency of
			Collection
Students complete	Course grades;	Official University	Annually
degree	faculty/mentor	student record;	
requirements.	checklists; EMT	program reports;	
	certification data	required EMT	
		reports	
Students	Confirmation from	AAMC; alumni	Annually
matriculate to	AAMC or related	surveys	
medical or health	office		
professions school.			
Non-med school	Self-report by	Alumni survey	Annually
applicants enter	graduate		
alternative career			
path.			
MBS graduates who	Response to survey	Survey of health	Data collected
matriculate to	questions.	professions program	annually but only
medical or health		directors and deans	once per cohort.
professions' school			
will perform			
favorably in			
comparison to			
graduates of other			
programs.			

School of Medicine Review and Oversight

Many School of Medicine programs have an external accreditation body that requires periodic self-study and provides oversight (e.g., Liaison Committee for Medical Education for the medical student program; National Accrediting Agency for Clinical Laboratory Sciences for the pathologist assistant program). For those programs that do not have such external accreditations, the School of Medicine Masters Oversight Committee (MOC) has been established to provide ongoing educational oversight. Chaired by the Director of Assessment for the SOM, the committee consists of senior leaders from each of the pertinent degree programs and a subset of representatives from the SOM programs that are externally accredited. Additional members include leadership from Duke AHEAD (Academy for Health Professions Education and Academic Development), and the Office of Diversity and Inclusion. On a yearly basis, each Program will submit an evaluation and learning plan to the MOC, using a specified template. The MOC will meet annually to review these documents and provide written feedback to each Program. The MOC may ask for progress reports and/or additional material. The MOC will formally review each program every three years on a rotating basis, and will monitor graduate outcomes, improvement plans, milestones, timelines, resources, and challenges. In addition, best practices will be shared among programs. Common challenges and opportunities to improve will be prioritized in a way to allow greater collaboration among programs in generating solutions. The MOC, along with individual programs, advocates for any additional resources necessary to meet educational goals.

J. Faculty, Staff, and Resource Requirements Review of Available Resources Faculty Resources

Core program faculty

As stated in Section F, the inaugural cohort of faculty for the MBS will be drawn, with faculty member and departmental approval, from those currently holding faculty appointments in the Duke University School of Medicine and Trinity College of Arts & Sciences; new faculty hires will not be required at this time. Faculty are enthusiastic and many have been a part of the planning process since first discussed.

	Advising	Admin.	Course dir./instr	Proseminar Small group leaders	
Alphin	٧		٧		
Andolsek	٧	٧	٧	٧	
Barmach			٧		
Bradley			٧		
Cabrey			٧		
Cullins	٧	٧			
Jackson	٧	٧	٧	٧	
Lee		٧	٧		
Muzyk	٧		٧		
Ossman			٧		
Ross	٧		٧	٧	
Schmitt			V		
Velkey			٧		
White	٧	٧	٧		
PA Faculty TBD	٧				
TBD*				٧	
TBD*				٧	
TBD*				٧	
* Each Proseminar small group, which will meet for 2					
hours weekly, will have 2 faculty co-leaders, recruited					
to reflect professional as well as ethnic and gender					
diversity.	diversity.				

Our faculty needs will grow as the number of MBS matriculants increases; these projected increases are reflected in the financial plan and budget included in Section K.

Elective course faculty

We have identified a number of relevant graduate courses within the SOM that will be appropriate electives for our students and whose course/program directors support enrolling our students in their courses on an individual and space available basis, with the permission of the pertinent instructor. The addition to these courses of a small number of our students on a space available basis and with the instructors' permission will not create additional demand or necessitate creating additional course sections for our students. A complete list of those courses is included in Appendix 6; letters from the faculty and/or program directors are included in Appendix 14.

Non-faculty staff

As noted in the description of the Administrative Structure and in the Organizational chart in Section F- Program Structure, the Program will be supported by a full-time Staff Assistant, a new position created and approved for this program. This Staff Assistant will report directly to Dr. Lee, the MBS Program Director, and will have many of the same responsibilities as do DGSAs (Director of Graduate Studies Assistants). As noted in Section K, other program support functions such as Financial Aid, Registrar, IT, etc. will be provided through the existing SOM infrastructure; our program budget will supplement the budgets of those units.

Administrative and Teaching Space

The MBS Program will utilize existing SOM space made available by the construction and occupation of the Trent Semans Center for Health Education (TSCHE). These spaces include: Davison Building Green Zone 4th floor classroom space; Davison Building Green Zone 7th floor student lounge; Yellow Zone ground floor human anatomy laboratories, classroom, and adjacent student locker area; Duke Clinic Amphitheater; and an Orange Zone ground floor office suite. It will not be necessary to construct new facilities to accommodate this new program.

MBS administrative space. The MBS program office will occupy dedicated administrative space in Suite 0159, Basement Orange Zone, Duke Clinic, an area that previously housed the SOM Office of Admissions prior to construction of the TSCHE. This space consists of a large reception area, three offices, conference room, and kitchenette with break area. The suite will house the Program Director, Staff Assistant, Assistant Dean for Premedical Education, and provide a faculty "swing" office space. The reception area, conference room, and kitchen will be open to students as well as program faculty and staff. Due to its

centralized location near the primary instructional spaces (see below) and as the conference room will also be available for student small group/team meetings, the Program will have a clearly identified "home" that serves as a central hub from which to operate.

MBS instructional space. The MBS will utilize classroom/lab spaces in the Duke Clinic (formerly known as Duke South) and the Trent Semans Center for Health Education (TSCHE) as follows:

- Anatomy Classroom 0101A Lecture Room, Duke Clinic Yellow Zone. This classroom has 65 fixed seats, audio/visual components (two projectors, podium microphone, pc access). It is ADA compliant and includes a sink and storage space. It is easily accessible to various Duke Clinic Purple Zone amenities. The MBS program and the SOM Normal Body course will be the primary occupants of this space during regular class days.
- Duke Clinic Amphitheater, adjacent to Food Court and Medical Center Bookstore. The 4,087 square foot facility is theater style fixed lecture seating with built in microphones. Capacity is 150; it is ADA compliant. The room is fully equipped with on board computer, A/V capability and whiteboards, and can accommodate TBL exercises. The MBS and Doctor of Physical Therapy (DPT) programs will be the primary occupants of this space during regular class days.
- Medical School Education Anatomy Lab, room 0042, Duke Clinic Yellow Zone. The Gross Anatomy Laboratory consists of a main dissection area of 4400 square feet with 39 individual stations. Each station is equipped with a surgical light, computer and two monitors. This area is served by 100% exhaust, so the air does not recirculate. Each station has low exhaust grills to pick up formaldehyde gas. The main dissection area has multiple first aid boxes, eye wash stations and a drench shower. The lab also contains both men's and women's locker/restrooms. Other occupants of this laboratory include the MD, DPT, Pathologist Assistant, and Physician Assistant programs as well as the undergraduate summer school course, Human Anatomy. The MBS Human Structure course will utilize these facilities in blocks of time on the annual instructional calendar that do not compete with the needs of the other occupants.
- M422, Davison Building Green Zone will be used as swing classroom and small group meeting space as needed for Medical Arts & Sciences sessions.
- TSCHE Learning Studios 1-4, Third Floor The MBS Medical Arts & Sciences
 Proseminar small group and professional skills practice sessions will be held in the
 TSCHE's learning studios, classrooms, and simulation laboratory. Portions of the EMTB training course will use the simulation laboratory.

• TSCHE 6th floor all-purpose student study/meeting/classroom space. The MBS Enhanced EMT-B training course will be held in this all-purpose space.

Faculty Space. Swing space for faculty will be available in one of the three offices in Suite 0159, Orange Zone, Duke Clinic. As the proposed program is non-departmentally based, and will draw its teaching faculty from those with existing appointments, permanent faculty office space will not be required.

Student Space. Social, collaborative, and study space for MBS students will be available in the Student Lounge, 4th floor, TSCHE, in Davison M422 (described above) and in the Davison Building 7th floor dedicated MBS student lounge. MBS student lockers are located in a protected hallway adjacent to the Anatomy Classroom and Laboratory, previously student locker space for the DPT program. It should be noted that the locker space, classrooms, anatomy lab and Amphitheater are in very close proximity to the MBS administrative office suite, Medical Center Bookstore, Duke Clinic Food Court and Dining Courtyard, Duke Clinic bus stop, Duke Clinic post office, and the Sarah P. Duke Gardens.

Library Resources. Students and faculty will have available to them the resources of the Duke University Medical Center Library & Archives, located in the Seeley G. Mudd Building adjacent to the TSCHE. The Library provides services and collections specifically to further biomedical education, research, and clinical care. It serves Duke Medicine faculty, staff, and students in the Schools of Medicine and Nursing, graduate programs in the biomedical sciences as well as Duke Hospital and Health System. There is a librarian assigned to work specifically with the SOM students.

K. Financial Considerations

The School of Medicine is fully committed to this degree, investing in the development, approval, and initial implementation through its reserves. This investment includes a commitment to sufficient leadership support and oversight through the appointment of a senior faculty member to the position of Assistant Dean for Premedical Education effective July 1 of 2015, with 40% effort dedicated to the program in FY15. By the end of Year Two, the program will comprise the majority of the Assistant Dean's funded effort. Once the program launches, it will be supported by revenue from tuition and fees, achieving a positive cash flow by Year Three, when a class size of 40 is enrolled. The base tuition rate for Year One (\$39,500) is competitive with that charged by comparable/competing programs and is in line with that charged by other professional master's degree programs within the SOM and in other professional schools of the University. Recovery of tuition and other revenue and distribution of budgeted funds will be in keeping with the standard SOM procedures.

Revenue and Expenses

As noted above and in Section B, program development is funded through School of Medicine reserve funds, and supports dedicated faculty and staff time for proposal and program development between July 1, 2013 and June 30, 2015. Continued administrative support after June 30, 2015 will be funded through tuition revenues.

Proposal and Program Development – Prelaunch		
2013-14	2014-15	
Program Director	Program Director	
(L.Lee)	(L.Lee)	
1 FTE	1 FTE	
	Assistant Dean for Premedical Education	
	(K. Andolsek)	
	.40 FTE	
	Staff Assistant	
	(TBD)	
	1 FTE	
	Associate Directors	
	(L. White and J. Jackson)	
	Combined .40 FTE	
	Course Directors	
	(Carbrey, Ossmann, Ross, Schmitt, Velkey, White)	
	Stipend and salary support for course development.	

Starting in FY 2016, the MBS program will begin self-sufficiency on monies generated by tuition and fees. The program will be able to leverage some resources in terms of the existing expertise and infrastructure that support the medical student education program

(e.g. Financial Aid, Registrar, Admissions, Office of Curriculum, Med Ed IT). The program will provide financial support on a per capita basis for the increased effort required of those offices to properly support an additional degree program.

We anticipate the program to attain an initial degree of financial sustainability in terms of revenue meeting/exceeding expenses by Year Three (FY 2018) when enrollment reaches 40 students per year; however full debt retirement will not occur until Year Five. Funds in excess of operating expenses will go toward repayment of reserve funds used for program start-up, toward increasing the number of scholarships available, and to support continued program improvements and development of new courses as recommended by our program evaluation.

We anticipate starting with an inaugural entering class of 20 students in Year One (AY/FY 2015-2016), followed by 30 and 40 students respectively in the two years following, before stabilizing at 50 students per year by Year Four (AY/FY 2018-19).

Year 1	Year 2	Year 3	Year 4	Year 5
2015-16	2016-17	2017- 18	2018-19	2019-20
20	30	40	50	50

Projected Revenues

Revenue sources will be tuition, a technology fee, and an application fee.

Tuition. The base tuition rate was derived after comparing tuition for other professional master's degree programs at Duke SOM (range \$13,370 - \$52,900 per year) and comparable/competing programs at other institutions (\$26,713 - \$47,839). In Year One (AY/FY 2014-15), tuition will be \$39,500. It will increase at a rate of 4% per year following.

Year 1	Year 2	Year 3 Year 4		Year 5
2015-16	2016-17	2017-18 2018-19		2019-20
39,500	41,080	42,723	44,432	46,209

Technology fee. In Years One and Two, the technology fee will be \$2,500 per student. This fee covers the cost of the required laptop computer, setup and configuration; computer support by the SOM IT staff; and copying expenses.

Year 1	Year 2	Year 3	Year 4	Year 5
2015-16	2016-17	2017- 18	2018-19	2019-20
2,500	2,500	2,750	2,750	3,000

Application fee. In Years One and Two, the application fee will be \$50 per applicant. It will increase to \$55 for Years Three and Four, and to \$60 in Year Five as follows:

Year 1	Year 2	Year 3	Year 4	Year 5
2015-16	2016-17	2017- 18	2018-19	2019-20
50	50	55	55	60

Based on prior experience with other programs, we estimate the number of fee-paying applicants to be:

Year 1	Year 2 Year 3 Year 4		Year 3 Year 4	
2015-16	2016-17	2017- 18	2018-19	2019-20
50	75	100	150	200

Total revenues projected for Years One through Five

Revenue projections are calculated with an estimated 4% yearly tuition increase and incremental fee increases as noted above. Although additional external sources of revenue will be explored, for budgeting purposes, none such revenue is assumed.

	Year 1	Year 2	Year 3	Year 4	Year 5
	2015-16	2016-17	2017- 18	2018-19	2019-20
Tuition revenue	790,000	1,232,400	1,708,928	2,221,606	2,310,471
Technology fee revenue	50,000	75,000	110,000	137,500	150,000
Application fee revenue	2,500	3,750	5,500	8,250	12,000
Total income from fees	52,500	78,750	115,500	145,750	162,000
External income	0	0	0	0	0
TOTAL	842,500	1,311,150	1,824,428	2,367,356	2,472,471

Expenses

Identification and estimation of program expenses is based upon our experience with other degree programs within the SOM, including the development and launch of the SOM's newest professional degree program, the Master of Biostatistics, in 2011. The table following lists these expenses in three main categories: student-related expenses, personnel, and other.

	Program Expenses
	Scholarships
	Laptop computers and software
Student related expenses	Student activities budget
	Student travel to present poster/research
	Administration
Demonsel	Advising (academic and career)
Personnel	Instruction
	Mentoring
	Space rental
	Facilities & equipment (computers, furnishings, printers, etc.)
	Office/operational expenses
	Website development/maintenance
	Recruitment and advertising
	Travel (professional and recruiting)
	Honoraria (guest speakers)
	Onboarding materials and fees
	Social events (retreats, welcome dinner, open house, graduation)
Other expenses	Food for business meetings
other expenses	Career services events (monthly lunches, onsite visits)
	Library expenses
	Faculty, student awards
	Gross anatomy materials
	EMT training equipment
	SOM Student Affairs per capita
	SOM IT per capita
	Miscellaneous
	Deposit to reserves
	Overhead charges from medical center
	OIT allocation

Regarding clarification of specific items included in the guidelines for proposal development:

Faculty pay. Faculty pay will be calculated and distributed utilizing the existing financial model for supporting educational effort in the School of Medicine. The SOM has implemented a financial model for medical student education that accounts for educational effort and departmental support of the educational mission. This model provides a set stipend for "consistent effort" (e.g. course directors, etc.) and allocates compensation for "occasional effort" (small group leaders, TBL, lectures, etc.) according to a predetermined formula.
A form of mission-based budgeting, the model employs what is referred to in the medical education literature as "educational relative value units," or eRVUs, a system based on that used for medical service reimbursement.⁸² Vice Dean Edward Buckley, MD, has been a national thought leader in creating a consistent mechanism for compensating clinical faculty for educational effort, and the Duke model has been adopted at many peer institutions.⁸³ These eRVUs assign "weights" to a variety of instructional activities that are germane to health professions education, including course leadership as well as clinical teaching, demonstrations, labs, lectures, workshops, and seminars. The MBS program will use the same eRVU system to compensate faculty who provide educational effort. Academic, career advising, and other key administrative functions are supported by either redirecting current effort or providing additional funding. Faculty compensation will follow the SOM's standard practice for transferring funds to departments for salary support and/or supplemental pay, whichever mechanism is most appropriate given an individual's faculty contract and department practice.

Space rental. Rent is not charged by the School of Medicine for educational programs; hence this item will be zero in our budget projections.

Scholarships. In keeping with SOM standard practice, 15% of tuition revenues will be made available for student scholarships. In Year One, 15% of the projected tuition revenue will enable us to fund three full tuition scholarships or to fund two full tuition scholarships and two half-scholarships. This practice will be unique among similar master's degree programs, which typically do not provide program-based scholarship assistance. We will evaluate the scholarship program annually to determine if future increases are warranted. In addition, we work with the SOM Development Office to explore other sources for scholarship funds.

University overhead charges. As an educational unit of the School of Medicine, we do not pay for "overhead" per se, general or administrative costs. Allocations for OIT (~2.03%) are assigned to individual budgets and are included in the final budget under "Indirect Costs." Clarification regarding the School of Medicine's support of University-wide resources (University Common Goods) is included in Appendix 14 (see Gibson letter).

Anticipated capitated costs for ancillary support services. Based on consultations with campus support services as noted in Section C–Rationale and Section L - Endorsements, we do not anticipate additional capitated costs for ancillary support services. Students will pay the standard Student Health fees and will purchase parking and/or bus permits; those fees directly support the affected services. Our budget includes support for advising, career services, and academic assistance for our students.

L. Endorsements, Commitments, and Support

Letters from Re	view/Approving Committees and Offices		
Committee	Chair/Representative	Date	
Basic Science Faculty Steering Committee	Herman F. Staats, Ph. D., Chair	1-13-14	
Clinical Sciences Faculty Council	Thomas L. Ortel, M.D., Ph.D., Chair	3-20-14	
School of Medicine	Nancy Andrews, M.D., Ph.D., Dean, School of Medicine	8-27-14	
School of Medicine, Finance	Scott Gibson, MBA Executive Vice Dean, Administration	9-4-14	
Masters Advisory Council	Paula McLain, Ph.D. and Brad Fox, Ph.D., Co-Chairs		
Academic Programs Committee	Edward J. Balleisen, Ph.D., Chair		
Office of the Provost	Sally Kornbluth, Ph.D., Provost		
Executive Committee of the Academic Council	Josh Socolar, Ph.D., Chair		
Academic Council	Josh Socolar, Ph.D., Chair		
Board of Trustees	David M. Rubenstein, Chair		

Letters from Campus Services

Office/Service	Director/Representative	Date
Counseling & Personal	Wanda Collins, Ph.D., Director	8-15-14
Services (CAPS)		
English for International	Maria Parker, EIS Program Director	9-30-14
Students		
Duke Police	John Dailey, Chief of Police	8-15-14
Health Professions Advising	Daniel Scheirer, Ph.D. Associate Dean,	7-15-14
	Trinity College of Arts & Sciences;	
	Director, Health Professions Advising	
Housing, Dining, & Residence	Rick Johnson, Assistant Vice President of	Email
Life	Student Affairs for Housing, Dining, &	7-9-14
	Resident Life	
Parking & Transportation	Melissa Harden, Interim Director; Chuck	In transit
Services	Landis, Manager, Parking Services	
Student Health	John Vaughn, MD, Director	8-14-14
University Administration	Kyle Cavanaugh, Vice President for	4-29-14

Administration						
Letters fro	m Consultants/Contracted Services					
Career Counseling Consultant	John Collison, PhD Director Global Learning & Development, Genworth Financial; formerly Associate Director, Duke Career Center	8-22-14				

Letters from Academic Units and Related Programs

Academic unit/program	Official	Date
Academic Assistance, SOM	Melanie Bonner, Ph.D.	8-4-14
Biostatistics Graduate	Gregory P. Samsa, Ph.D., Director of	5-14-14
Programs, Department of	Graduate Studies	
Biostatistics & Bioinformatics		
Collegiate Athlete Premedical	Henry S. Friedman, M.D.	7-22-14
Experience Program	Professor, Neurology and Surgery	
(CAPE)		
Clinical Research Training	Steven C. Grambow, Ph.D., Vice Chair for	6-2-14
Program, Department of	Education and Director, Clinical Research	
Biostatistics & Bioinformatics	Training Program,	
Department of Community	J. Lloyd Michener, M.D., Professor and	6-25-14
and Family Medicine	Chair; Director, Duke Center for	
	Community Research	
Department of Community	Justine Strand de Oliveira, DrPH, Professor	7-25-14
and Family Medicine	and Vice Chair for Education	
Division of Community Health	Michelle Lyn, MBA, MHA	8-4-14
	Director	
Division of Emergency	Eric Ossmann, MD	8-26-14
Medicine	Director Prehospital Medicine & Duke	
	Preparedness & Response Center	
	Vice-Chief and Associate Professor	
	Division of Emergency Medicine	
	Associate Chief Medical Officer	
	Duke University Health System	
Department of Psychiatry and	Andrew Muzyk, Pharm.D	9-2-14
Behavioral Sciences (Duke)	Adjunct Assistant Professor (Duke) and	
and Department of Pharmacy	Assistant Professor (Campbell)	
Practice (Campbell University		
School of Pharmacy & Health		
Sciences)		

Hubert-Yeargan Center for	G. Ralph Corey, M.D., Director	7-30-14
Global Health	Vice Chair for Education and Global Health,	
	Department of Medicine	
Master of Health Sciences-	Anh Tran, Ph.D., Director	8-13-14
Clinical Leadership		
Master of Health Sciences	Patricia M. Dieter, MPA, PA-C	9-22-14
(Physician Assistant Program)	Professor and PA Division Chief,	
	Department of Community & Family	
	Medicine	
Trinity College of Arts &	Lee D. Baker, Ph.D., Dean of Academic	5-13-14
Sciences	Affairs	

Letters from Instructors of Elective Courses

Course(s)	Faculty	
CLR 206 Quality Improvement	Dop Bradlov, MD, MHS CL	6 26 14
for Clinical Loadors	Don Bradley, MD, MIIS-CL	0-20-14
	lana Cagliardi MD	7114
NEDICINE-433C. Evidence-	Jane Gagnarui, MD	7-1-14
Based Medicine: Patient-		
Centered, Clinically Relevant		
Utilization of Medical		
History 369 The History of	Margaret Humphreys, MD, PhD	6-19-14
Public Health and Epidemic		
Disease in America; History		
371 Feast or Famine: Food in		
Global History		
COMMFAM-221C Practical	Franca Alphin, MPH, RD	8-21-14
Clinical Nutrition		
CLP 210 The Successful Clinical	Devdutta Sangvai, MD, MBA	6-19-14
Leader; CLP 211		
Fundamentals of Healthcare		
Finance; research project		
INTERDIS 330B – the Evolution	Ross McKinney, MD	9-4-14
of Bioethics in the 20 th		
Century		
CLP 213 - Health Care	Justine Strand de Oliveira, DrPH, PA-C	7-22-14
Organization and Policy	Professor and Vice Chair for Education,	
	Community & Family Medicine; Professor,	
	School of Nursing	
INTERDIS 155 & 156 - Medical	Dennis Clements, MD, PhD, MPH	7-22-14
Spanish and INTERDIS 422C &	Professor, Pediatrics & Global Health	
423C -Exploring Medicine in	Director, DGHI Medical School Programs	
Other Cultures	Chief, Duke Children's Primary Care	

Letters from External Entities					
Durham County Emergency	Kevin Underhill	8-28-14			
Medical Services					
Quintiles	Oren Cohen, M.D.	8-8-14			
	SVP – Global Head of Early Clinical				
	Development				
Research Triangle Institute	Doris Rouse, PhD, Vice President of Global	8-25-14			
	Health, Research Triangle Institute (RTI)				

M. Five Year Student, Faculty, and Resources Projections

Student projections:

As noted in Section K, Financial Considerations, we anticipate starting with an inaugural entering class of 20 students in Year One (AY/FY 2015-2016), followed by 30 and 40 students respectively in the two years following, before stabilizing at 50 students per year by Year Four (AY/FY 2018-19).

Year 1	Year 2	Year 3	Year 4	Year 5
2015-16	2016-17	2017- 18	2018-19	2019-20
20	30	40	50	50

These projections are based on our comparisons of the enrollment in existing programs conversations with directors of other programs, the market analysis completed by the Fuqua Consulting Team ⁶⁷ and the level of interest expressed by graduating Duke seniors in the spring of 2014 described earlier.

Administrative support projections:

As noted in the introduction to this section, administrative support and effort for this program has been provided by the SOM for the two years leading up to the planned program launch in order to build a solid program infrastructure and to ensure faculty engagement in all levels of program development. That support will increase steadily as the program grows from 3.9 FTE in Year One to 4.7 FTE in Year Four, and is demonstrated in the table following.

	Year 1	Year 2	Year 3	Year 4	Year 5
	2015-16	2016-17	2017- 18	2018-19	2019-20
Assistant	.50	.60	.70	.80	.80
Dean					
Program	1.0	1.0	1.0	1.0	1.0
Director					
Associate	.40	.40	.40	.40	.40
Program					
Directors					
Staff	1.0	1.0	1.0	1.0	1.0
Assistant					
Advising	1.0	1.0	1.5	1.5	1.5
(includes					
OHPA, and					
Academic					
Support)					
Total admin	3.9	4.0	4.6	4.7	4.7

Faculty Projections:

The table following projects the estimated educational/instructional effort per the SOM faculty pay model described earlier (Consistent Effort for Course Directors and Occasional Effort for other instructional roles and activities) required to implement the MBS curriculum for the first five years of the program. The projections account for the development of new elective offerings in Years 2, 3 and 4, and for the impact of increasing student numbers, in the Medical Arts & Sciences Proseminar small group sessions, and in the Enhanced EMT Course. Projected numbers of faculty mentors required for increasing numbers of students who choose the Elective Option 1 (mentored student projects) are also included here.

Projected Educational/Instructional Effort							
	Y1	Y2	Y3	Y4	Y5		
Consistent Effort –	9	10	11	12	12		
# Course directors/estimated	/128,000	/165,500	/191,000	/216,500	/216,500		
total stipend							
Occasional Effort –	3,082	3,562	4,163	4,764	4,764		
#eRVUs/total compensation	/191,080	/220,840	/258,100	/295,360	/295,360		
Faculty Mentors -	15	23	30	38	38		
	/18,000	/27,600	/37/500	/47.500	/49,400		
TOTAL	337,080	413,940	486,600	559,360	561,260		

Five Year Budget/Resource projection:

The table following projects the financial resource categories of the program each year for the first five years of the program.

	Year 1	Year 2	Year 3	Year 4	Year 5
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Student intake	20	30	40	50	50
Tuition rate (4% increase per year)	39,500	41,080	42,723	44,432	46,209
Technology fee	2500	2500	2750	2750	3000
Application fee	50	50	55	55	60
INCOME					
Tuition revenue	790,000	1,232,400	1,708,928	2,221,606	2,310,471
Technology fee revenue	50,000	75,000	110,000	137,500	150,000
Application fee revenue (guestimate)	2,500	3,750	5,500	8,250	12,000
Total income from fees	52,500	78,750	115,500	145,750	162,000
External income	0	0	0	0	0
TOTAL INCOME	842,500	1,311,150	1,824,428	2,367,356	2,472,471

	Year 1	Year 2	Year 3	Year 4	Year 5
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
EXPENSES					
Student-Related					
Scholarships paid directly by program	118,500	184,860	256,339	333,241	346,571
Laptop computers and installed software	40,000	63,000	88,000	115,000	120,000
Student activities budget	5,000	8,250	12,000	16,250	17,500
Student travel to present poster/research	2,500	3,750	5,000	6,250	6,250
Total Student-Related Expenses	166,000	259,860	361,339	470,741	490,321
Personnel					
Teaching	319,080	386,340	449,100	511,860	511,860
Advising, career & learning specialist support	60,000	61,200	93,636	95,509	97,419
Faculty mentors (for project-based Elective Option 1)	18000	27,600	37,500	47,500	49,400
TOTAL TEACHING, ADVISING, MENTORING	397,080	475,140	580,236	654,869	658,679
TOTAL ADMIN	320,459	348,196	376,915	406,643	437,409
Total Personnel	717,539	823,336	957,151	1,061,511	1,096,088
Other Expenses					
Space rental	0	0	0	0	0
Facilities & equipment (computers, furnishings, printers, etc.)	5,000	2,500	2,575	2,652	2,732
Office/operational expenses	1,250	1,288	1,326	1,366	1,407
Website development/maintenance	5,000	5,150	5,305	5,464	5,628
Recruitment and advertising	10,000	10,300	10,609	10,927	11,255
Travel (professional and recruiting)	15,000	17,500	17,500	20,000	20,000
Honoraria (guest speakers)	5,000	5,150	5,305	5,464	5,628
Onboarding materials and fees	3,000	4,500	6,000	7,500	7,500
Social events (retreats, welcome dinner, open house, graduation)	10,000	15,000	20,000	25,000	25,000
Food for business meetings	1,000	1,030	1,061	1,093	1,126
Career services events (monthly lunches,	2,400	2,472	2,546	2,623	2,701
onsite visits)					
Library expenses	250	258	265	273	281
Faculty, student awards	500	515	530	546	563
Gross anatomy materials	6,000	9,000	12,000	15,000	15,000
EMT training equipment	10,000	2,500	10,000	2,500	2,500
SOM Student Affairs per capita	15,000	22,500	30,000	37,500	37,500
SOM IT per capita	15,000	22,500	30,000	37,500	37,500
Miscellaneous (5% of tuition)	39,500	61,620	85,446	111,080	115,524

	Year 1	Year 2	Year 3	Year 4	Year 5
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Deposit to reserves (5% tuition)	39,500	61,620	85,446	111,080	115,524
Indirect Expenses					
Overhead charges from medical center	0	0	0	0	0
OIT allocation (2.03%)	18,170	28,345	39,305	51,097	53,141
Total Other Expenses	201,570	273,747	365,220	448,665	460,508
TOTAL ALL EXPENSES	1,085,109	1,356,943	1,683,710	1,980,917	2,046,916
GAIN/(LOSS)	(242,609)	(45,793)	140,718	386,439	425,554
FY 2014 Investment from SOM reserve	(178,900)				
funds					
FY 2015 Investment from SOM reserve	(474,994)				
funds					
CUMULATIVE GAIN/LOSS	(896,503)	(942,296)	(801,577)	(415,138)	10,416

* Personnel related items = 2% increase per year; Inflation on other items = 3% increase per year

The MBS is committed to effective stewardship of its resources and to providing high educational value for its students. The tuition for the MBS will be paid to the SOM. The SOM in turn, will be responsible for the program's expenses. Based upon our projections, the MBS is expected to retire its debt for program development and initial start-up costs from FY 14 and FY15 and be fully sustainable by Year 5. By Year 5, additional revenues will be available to deploy, based on lessons learned during the prior four years, for continued program enhancements through development of additional elective courses, material development, and facilities upgrades.

N. Students

The MBS program is designed to appeal to a very focused and motivated pool of students, those who have an expressed desire to pursue careers in the health professions, primarily medicine, and secondarily, those who are interested in exploring other health professions such as physical therapy, physician assistant, dentistry, osteopathy, and podiatry. Initially, with interest expected to grow over time, the program will also appeal to a smaller population desiring graduate biomedical science integrated with clinical experience for careers in the rapidly evolving healthcare and biomedical sciences fields. This pool of students will reflect that of medical school applicants, and will have completed (by time of matriculation in our program) a four-year degree from an accredited institution and the standard prerequisites for admission to medical school. (See Section F – Program Structure for Admission Requirements)

Following are descriptions of prototypical students to whom our program of study will be attractive and the role of the each curriculum component in meeting the needs of those students.

- Graduating college seniors who are medical school aspirants. Strong science background but inadequate clinical and service exposure.
 - The EMT experience will provide professional formation, identity, and experiences as a critically important member of the health care team. Patent care experiences will expose students to the complexity of the health care system and the multiple existing and emerging roles to better serve patients. Reflective experiences will facilitate an understanding of the biopsychosocial and ethical issues.
- Graduating college seniors who are still in career exploration. Pondering a medical/health related careers but unready to make the commitment.
 - Core courses will provide greater exposure to the sciences, experience as a member of the health care team, and exploration of personal strengths and likely good fits for career opportunities. Faculty from multiple health care professions will serve as instructor role models and advisors. Electives will help students explore potential interests in new fields such as Quality and Patient Safety.
- First generation and URM students, and others who are promising academically.
 - Course work will provide an additional year of strengthening in advanced, integrated sciences. Individualized advising and application preparation will help students optimize their application strategy.

 "Near hits" – The high end of the unsuccessful applicant pool; those who failed to gain entry to medical school on first application, but whose MCAT scores and grades overlap with those who did. This pool's numbers have ranged from over 11,000 to 13,000 over a five -year period, according to data obtained from the AAMC by Professor Dona Chikaraishi and the original program Advisory Committee.

The Program will take an individualized approach to help students identify opportunities for strengthening and filling in "the gaps." For some of these students it may be greater strength of or more recent coursework in biomedical sciences. For others their application process may not have been as strategic, applying to "too few schools" or an inadequate variety of schools. Some may need coaching in their application materials such as preparation of a personal statement and secondary essays. Others would benefit from practice in typical interview formats.

Recruitment plans

Students will be recruited locally and nationally. In terms of local recruitment, we will follow the recommendations of the Fuqua Consulting report in reaching out to Duke seniors and graduates. This strategy was effective for other professional master's degree programs at Duke (Master of Management Studies and Master of Engineering Management) and targets a population of strong academic and highly motivated candidates. In fact, without any advertising, six graduating seniors in 2014 learned of our plans, approached members of our faculty, and expressed a desire to enroll at Duke, rather than the programs into which they had been accepted. The Chief Health Adviser, Dr. Daniel Sheirer, confirms that his office is aware of ten to fifteen Duke seniors per year who matriculate to such programs while working toward medical school admission. (Section L - Endorsements). Our local recruiting strategy will include providing information about the program in materials, presentations, and on the web sites of the Duke OPHA and the Summer Medical and Dental Education Program. Other communications channels will be explored during meetings planned between the MBS leaders team and the OHPA advising staff.

In addition to promoting the program within the Duke University community, we will pursue strategic marketing as guided by a communications plan developed in collaboration with the Duke SOM Communications Office, Jill Boy, Director. Key features of our communications plan, in addition to a web presence through a program website and social media, will be to connect with potential students and their advisers through well-known and easily accessible avenues For example, the program will be listed on the Association of American Medical Colleges "Aspiring Docs" web site, which has a searchable database of post-baccalaureate premedical programs, including Special Master's Degree programs. We will be able to build networks and to direct strategic marketing to other university health professions advising offices through our participation in the National Association of Advisers for the Health Professions (NAAHP). NAAHP is an organization of over 1000 health professions advisors at colleges and universities throughout the United States. We will promote the MBS through attendance at national and regional meetings, by establishing networks with the premedical advisers of other member institutions, and by participating in the associated "Meet the Deans" Health Education Fair, attended in 2014 by close to 800 premedical and prehealth students from across the country.

Student Number Projections

The table below projects the number of students in the MBS each year for the first five years of the program. These projections are based on comparisons with other top programs and in consideration of our institutional resources. Programs range considerably in size, generally from 15 to over 150 with a few notable exceptions. (See Appendix 1). Student enrollments in other programs vary widely. For example, the program at Wake Forest described earlier anticipates accepting a maximum of 10 students their inaugural year, 2014-15.⁸⁴ At Columbia, which offers a highly regarded non-degree certificate program, enrollment grew to 606 students in 2012 from 282 in 2000.⁸⁵

We believe our projections are conservative, reasonable, and attainable, allowing us both to recruit a talented and diverse student body and to offer a high quality program with a high level of faculty-student engagement.

	Year One	Year Two	Year	Year Four	Year Five
	2015-16	2016-17	Three	2018-19	2019-20
			2017-18		
Total matriculating	20	30	40	50	50
students					

Student Trajectory, Academic and Career Advising

Graduates of the MBS program are expected to emerge from the MBS with a solid biologic foundation, conversant in the language of medicine and the human biological sciences; skilled in self-assessment and reflective practice; and effective in team-based practices as learners and as members of a health care team. Demonstration of these competencies will enable them to be highly competitive candidates for medical and other health professions schools, as well as for related biomedical sciences careers. Effective and intentional academic and career advising is essential to meeting these expectations.

Academic and Career Advising

As noted in Section H, each student will be assigned a faculty adviser from our program's adviser team (See table following). This adviser will participate in the program onboarding activities during which students will complete an intake assessment. This assessment will include selected inventories, such as the Myers-Briggs Type Inventory, the Interprofessional Education Appraisal Inventory, and an incoming competence self-assessment. These data will inform the preparation of each student's individual Action Plan, the roadmap to be used with the adviser to track progress toward the student's goals and toward completion of degree requirements. Advisers will partner with the OHPA adviser (supported by MBS) assigned to the MBS students and will meet with their advisees on a regularly scheduled basis though out the program to facilitate academic guidance as well as to explore career options and to connect students with alternative career opportunities. In addition, students offered admission to the program who plan to apply to medical or another health professions school will be offered a pre-matriculation advising option to ensure that those students understand the application process and are on track to prepare for the various application deadlines during their program of study.

MBS Advisory Team	Areas of Emphasis
Franca Alphin, MPH, RD, CSSD, CEDRD, LDN	Nutrition sciences
Kathryn Andolsek, MD, MPH	Medicine, Physician Assistant
Edward G. Buckley, MD	Medicine
Maureen Cullins, MS	Medicine, dentistry and allied health
Joseph A. Jackson, MD	Medicine
Andrew Muzyck, PharmD.	Pharmacy
Elizabeth Ross, DPT	Physical Therapy
Leonard E. White, PhD	Medicine & graduate biomedical sciences
PA Advisor—to be determined	Medicine, Physician Assistant
OHPA Adviser – to be determined	Health professions
Career Counselor- John Collison, PhD	Non-clinical careers in biomedical sciences

In addition to the career advising provided by the faculty advisers, the directors of other health professions program within SOM will be available to meet with students who desire additional information about other health careers. Students will be able to attend the evening career networking events sponsored by the SMDEP and those of the Master of Clinical Informatics program as well as campus-wide career fair events sponsored by the Duke Center for Career Services. In addition, we have an agreement with an experienced career counselor and consultant who has agreed to provide one-on-one career counseling and workshops on resume preparation and interviewing for our students. (See Section L – Endorsements and Appendix 14 – Letters)

Finally our students will be citizens of the University. We have met with Duke Graduate and Professional Student Council (GPSC) to learn about the opportunities for our students' participation and confirm that our students would have an elected GPSC representative. There are opportunities for student leadership within one year programs.

O. General Characteristics of the Applicant Pool

Students for the program's inaugural student cohort will be drawn from a known population of individuals with strong academic backgrounds and an explicit interest in science, health or medicine – potential medical school applicants and re-applicants.

We selected this population for our inaugural student cohort due to its known academic demographics, the relative homogeneity of which will enable us to more easily evaluate, revise, and stabilize our curriculum early in the program's trajectory. In addition, the size and academic caliber of this population is impressive. Applicant numbers for MD granting programs in the United States grew from just over 42,268 in 2009 to 48,014 in 2013.^{86,87} The ratio of applicants to accepted applicants is higher than at any point since 1999. Of the applicants who did not gain acceptance over the last five years (23,000 to 27,000 per year), approximately half recorded GPAs equal to or exceeding 3.0 and MCAT scores of 27 or higher, scores that overlap with those who did matriculate to US medical schools⁸⁸ an indicator of the excellent student caliber within our initial target population. In 2013 over a fourth of medical school applicants were "repeat applicants" who has been unsuccessful previously. The number of "repeat applicants" has risen steadily over the last four years, from 10,909 in 2010 to 12,287 in 2013.⁸⁹ In addition, matriculant data suggests that increasing numbers of medical school applicants acquire master's degrees prior to entering medical school. The AAMC matriculating student summary report of 2013 reports that 25.5% of matriculants had pursued graduate studies prior to matriculation in medical school.⁹⁰ In 2010, in fact, 12% of medical school entrants responding to a survey had first completed a post-baccalaureate premedical education training program.¹

Additional smaller pools of potential students would be counterpart osteopathic school applicants⁹¹, former student athletes whose training schedules preclude adequate time for preparing medical school applications, college graduates whose interest in the health professions developed late in their undergraduate studies, and those who wish additional experience and preparation prior to initiating the application process.

P. Opportunities Available to Graduates

We anticipate that our graduates will be prepared to either pursue further educational opportunities in health related fields or enter into careers which require a basic background in medical science. They will be well prepared to matriculate in medical school, physical or occupational therapy school, physician assistant programs, or dental schools. In addition to entering careers oriented to providing healthcare services, many graduates will become science educators at secondary schools and community colleges, pursue research careers in a biomedical science, or enter positions within industry, pharma, and academic health centers. Some may become consultants, or work in health journalism. Still others may be recruited to roles in healthcare administration or even Homeland Security, with community or state-level disaster preparedness units. (See Appendix 14: Letters). With the further implementation of the Affordable Care Act, we anticipate major redesign in health care delivery and believe our graduates will have the critical skills needed to assist with delivering health care in this new environment in health profession roles that are currently evolving.

The MBS will provide an important benefit to students seeking doctoral degrees in the biomedical sciences. Rather than obtaining a full MD degree, the combination of this program with a PhD in a medically related science field can give valuable insight to basic research in biomedical fields without the need to acquire a formal medical degree. Our current doctoral students in biological sciences face an increasingly competitive future with continued projected decreases in NIH and other funding opportunities. They may benefit from the MBS to better prepare them for a translational area of research.

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APPENDICES

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Appendix 1: Identified Competitors

	Tuition	Typical entering class size/avg GPA and MCAT if known	Guaranteed interview for host school's SOM?	Success rate (admissions to ms, grad or other)
Boston U MA in Medical Sciences MS in Oral Sciences	45,686 2014-15	MA – 160-170 MS – 15-20	Unknown	Of those who apply, 70%; of those, 25-30 are accepted by BU SOM
Georgetown SMP	47,839 2014-15	100+	Not guaranteed, but ~50% do get an interview	50% within 1 year; overall 80% within 2 years
Johns Hopkins MS in Biotechnology, Health Science Intensive Program	43,620 2014-15	30	No	Not reported
U of Michigan MS Physiology MS in Human Genetics	20,406 Mich res 40,892 non-res	20-25/ 3.47 29.3	No	Not reported
NY Medical College Accelerated MS in Biomed Sci 30 cr minimum	29,250 2014-15 (975/cr hr)	25	Yes, IF do well.	Not reported
NY Medical College Traditional MS in Biomed Sci 30 cr minimum	29,250 2014-15 (975/cr hr)	Not reported	Not reported	Not reported
Tulane MS Anatomy	26,500 2014-15	20	No	Not reported
Tulane MS Micro & Immunology	22,750 2014-15	15	No	Not reported
Tulane MS Pharm	23,500 2014-15	<35	No	2/3 of those who applied
Tulane MS Human Gen	22,000 2014-15	12-18/ GPA 3.2 MCAT 28	No	90% within 2 years of completion
Tulane MS Biochem & Mol Biology	23,500 2014-15	15	No	Not reported
Wake Forest University MBS	34,634 2014-15	10 for 2014-15, first year of revised program	Not reported	NA

Appendix 2: MBS Mission and Values Statement

Master of Biomedical Sciences Updated Statement of Program Values and Responsibilities 12-03-2013

Mission

The mission of the MBS program is to educate and mentor individuals who will be highly competitive candidates for schools of medicine and related health science professions by providing the best combination of academic preparation, patient-oriented service learning, advising, and professional development activities.

Our goal is to effectively match our students with the best opportunities for success in the health professions and/or related biomedical fields, and by so doing be described as one of the top such master's degree programs by premedical and prehealth advisers within five years.

Program Values

"Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability."

- Duke University Community Standard

"In keeping with its heritage, it [Duke School of Medicine] seeks to provide socially relevant medical education, research, and patient care and is expressly committed to the search for solutions to regional, national, and global health care problems."

- 2013-14 Bulletin, Duke University School of Medicine

The program values diversity, self-awareness, service, learner well being, and teamwork. It aspires to foster a joy and passion for learning, and to develop individual and collegial professionalism.

Principles	Practices
Patient Centeredness	Expecting students to treat patients, their
(We will promote patient-centered care	families, and other members of the health
throughout the curriculum by example as	care team with respect and dignity.
well as through our modes of instruction,	
mentoring, and assessment.)	Treating our students with respect and
	dignity, recognizing their diverse needs,
Learner responsibility, individuality, and	talents, and goals.
wholeness	
(We will provide an educational experience	Providing a high quality curriculum that is
that promotes learner responsibility,	consistent with the Program's mission, and

Principles	Practices
respects diversity, and recognizes the	with the goals of the School of Medicine
reality of finite student resources.)	and the University.
Perpensible conduct of adjucational	Employing instructional stratogies that are
responsible conduct of educational	Employing instructional strategies that are
practice	most appropriate for our learning goals,
	promote critical trinking, and are most
learning and in our interactions with all	likely to result in our desired outcomes.
nearthing, and in our interactions with an	Enabling appropriate individualization in
students faculty staff nationts and	enabling appropriate individualization in
students, faculty, stan, patients, and	each student's program of study through
	carefully selected elective courses and
Interdisciplinery operations	experiences conaboratively with MBS
Me will build upon Duke's strongths in	duviser
(we will build upon Duke's strengths in	Communicating clearly our expectations of
interdisciplinary program development in	communicating clearly our expectations of
and magningful experience)	our students and the reciprocal
and meaningful experience.)	expectations they should have of us.
Transparency	Providing faculty members who are expert
(We will make public our goals,	in their fields and committed to student
expectations, methods, and assessment of	learning and mentorship.
program outcomes.)	. .
	Utilizing evaluation methods that are
Learning through service	consistent with learning activities and
(We will include a substantial hands-on	desired outcomes, and that enable
service learning experience to develop	frequent feedback for improvement.
reflection and self-assessment as tools for	
lifelong learning.)	Keeping students informed regarding their
	progress in the program.
Collaborative learning	
(We will facilitate collaborative, peer-	Providing honest, valid, and reliable
interdependent learning to achieve greater	summative evaluations that enable
depth, breadth and retention of	students to benchmark their academic and
knowledge.)	professional progress against their desired
	career paths.
Continuing quality improvement	
(We will systematically review the content,	Implementing a comprehensive plan for the
conduct, and outcomes of the program,	evaluation of both the program and
with the goal of continuous improvement.	students that incorporates periodic external
	review, authentic assessment, input from
Fiscal integrity	varied stakeholders and frequent feedback.
(We will administer a financially sustainable	

Principles	Practices
program that respects students' resources,	
provides appropriate support for quality	
teaching and learning, and generates a	
reasonable margin in revenue.)	
Professionalism	
(We will promote professionalism	
throughout the curriculum by example as	
well as through our modes of instruction,	
mentoring, and assessment.)	

Educational Plan

To achieve our goals, we will provide a cross-disciplinary curriculum consisting of:

- Rigorous, professional/graduate-school level academic education in the biological sciences that provide the foundation for the medical arts and sciences clinical practice, including human anatomy with cadaveric dissection
- Training and service as an Emergency Medical Technician coupled with guided practice in the tools of self-assessment and critical reflection
- An introduction to foundational concepts of patient safety and systems improvement.
- Elective courses to meet individual student needs and interests.
- Practical training in skills underlying the preparation and delivery of a competitive professional school application (e.g. critical reflection, expository writing, problem-solving, multi-station performance-based interview exercises, professional communication, and academic skill development including standardized test-taking).
- Opportunities to explore alternative health science careers.

Appendix 3 – Physician Competencies

Reference List of General Physician Competencies*,[†]

1. Patient Care

Provide patient-centered care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health

- 1.1 Perform all medical, diagnostic, and surgical procedures considered essential for the area of practice
- I.2 Gather essential and accurate information about patients and their conditions through history-taking, physical examination, and the use of laboratory data, imaging, and other tests
- 1.3 [‡]Organize and prioritize responsibilities to provide care that is safe, effective, and efficient
- 1.4 [‡]Interpret laboratory data, imaging studies, and other tests required for the area of practice
- 1.5 Make informed decisions about diagnostic and therapeutic interventions based on patient information and preferences, up-to-date scientific evidence, and clinical judgment
- 1.6 Develop and carry out patient management plans
- 1.7 Counsel and educate patients and their families to empower them to participate in their care and enable shared decision-making
- 1.8 [‡]Provide appropriate referral of patients including ensuring continuity of care throughout transitions between providers or settings, and following up on patient progress and outcomes
- 1.9 Provide health care services to patients, families, and communities aimed at preventing health problems or maintaining health
- 1.10 [‡]Provide appropriate role modeling
- 1.11 [‡]Perform supervisory responsibilities commensurate with one's roles, abilities, and qualifications

2. Knowledge for Practice§

Demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care

- 2.1 Demonstrate an investigatory and analytic approach to clinical situations
- 2.2 Apply established and emerging bio-physical scientific principles fundamental to health care for patients and populations
- 2.3 [‡]Apply established and emerging principles of clinical sciences to diagnostic and therapeutic decision-making, clinical problem-solving, and other aspects of evidencebased health care
- 2.4 [‡]Apply principles of epidemiological sciences to the identification of health problems, risk factors, treatment strategies, resources, and disease prevention/health promotion efforts for patients and populations
- 2.5 [‡]Apply principles of social-behavioral sciences to provision of patient care, including assessment of the impact of psychosocial and cultural influences on health, disease, care seeking, care compliance, and barriers to and attitudes toward care

2.6 [‡]Contribute to the creation, dissemination, application, and translation of new health care knowledge and practices

3. Practice-Based Learning and Improvement

Demonstrate the ability to investigate and evaluate one's care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning

- 3.1 Identify strengths, deficiencies, and limits in one's knowledge and expertise
- 3.2 Set learning and improvement goals
- 3.3 Identify and perform learning activities that address one's gaps in knowledge, skills, and/or attitudes
- 3.4 Systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement
- 3.5 Incorporate feedback into daily practice
- 3.6 Locate, appraise, and assimilate evidence from scientific studies related to patients' health problems
- 3.7 Use information technology to optimize learning
- 3.8 Participate in the education of patients, families, students, trainees, peers, and other health professionals
- 3.9 Obtain and utilize information about individual patients, populations of patients, or communities from which patients are drawn to improve care
- 3.10 [‡]Continually identify, analyze, and implement new knowledge, guidelines, standards, technologies, products, or services that have been demonstrated to improve outcomes

4. Interpersonal and Communication Skills

Demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals

- 4.1 Communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds
- 4.2 Communicate effectively with colleagues within one's profession or specialty, other health professionals, and health related agencies (see also 7.3)
- 4.3 Work effectively with others as a member or leader of a health care team or other professional group (see also 7.4)
- 4.4 Act in a consultative role to other health professionals
- 4.5 Maintain comprehensive, timely, and legible medical records
- 4.6 [‡]Demonstrate sensitivity, honesty, and compassion in difficult conversations, including those about death, end of life, adverse events, bad news, disclosure of errors, and other sensitive topics
- 4.7 [‡]Demonstrate insight and understanding about emotions and human responses to emotions that allow one to develop and manage interpersonal interactions

5. Professionalism

Demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles

5.1 Demonstrate compassion, integrity, and respect for others

- 5.2 Demonstrate responsiveness to patient needs that supersedes self-interest
- 5.3 Demonstrate respect for patient privacy and autonomy
- 5.4 Demonstrate accountability to patients, society, and the profession
- 5.5 Demonstrate sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation
- 5.6 Demonstrate a commitment to ethical principles pertaining to provision or withholding of care, confidentiality, informed consent, and business practices, including compliance with relevant laws, policies, and regulations

6. Systems-Based Practice

Demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care

- 6.1 Work effectively in various health care delivery settings and systems relevant to one's clinical specialty
- 6.2 Coordinate patient care within the health care system relevant to one's clinical specialty
- 6.3 Incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care
- 6.4 Advocate for quality patient care and optimal patient care systems
- 6.5 Participate in identifying system errors and implementing potential systems solutions
- 6.6 [‡]Perform administrative and practice management responsibilities commensurate with one's role, abilities, and qualifications

7. Interprofessional Collaboration

Demonstrate the ability to engage in an interprofessional team in a manner that optimizes safe, effective patient- and population-centered care

- 7.1 Work with other health professionals to establish and maintain a climate of mutual respect, dignity, diversity, ethical integrity, and trust
- 7.2 Use the knowledge of one's own role and the roles of other health professionals to appropriately assess and address the health care needs of the patients and populations served
- 7.3 Communicate with other health professionals in a responsive and responsible manner that supports the maintenance of health and the treatment of disease in individual patients and populations
- 7.4 Participate in different team roles to establish, develop, and continuously enhance interprofessional teams to provide patient- and population-centered care that is safe, timely, efficient, effective, and equitable

8. Personal and Professional Development

Demonstrate the qualities required to sustain lifelong personal and professional growth

- 8.1 Develop the ability to use self-awareness of knowledge, skills, and emotional limitations to engage in appropriate help-seeking behaviors
- 8.2 Demonstrate healthy coping mechanisms to respond to stress
- 8.3 Manage conflict between personal and professional responsibilities
- 8.4 Practice flexibility and maturity in adjusting to change with the capacity to alter one's behavior
- 8.5 Demonstrate trustworthiness that makes colleagues feel secure when one is responsible for

the care of patients

- 8.6 Provide leadership skills that enhance team functioning, the learning environment, and/or the health care delivery system
- 8.7 Demonstrate self-confidence that puts patients, families, and members of the health care team at ease
- 8.8 Recognize that ambiguity is part of clinical health care and respond by utilizing appropriate resources in dealing with uncertainty

* This list is not intended to supplant any current regulatory requirements. It is solely intended as a robust reference list of physician competencies that captures the essence of competency frameworks published as of June 2012.

 ⁺ Unless otherwise indicated, the domains of competence are reproduced or adapted from the following sources: Domains 1–6, Accreditation Council for Graduate Medical Education, General Competencies¹⁶ and Common Program Requirements^{17,18}; Domain 7, Interprofessional Education Collaborative Expert Panel, Core Competencies for Interprofessional Collaborative Practice²⁰; Domain 8, Pediatrics Milestone Working Group,

Pediatrics Milestone Project.²¹ Some of the competencies in each domain represent modifications or adaptations of original language to accommodate overlapping concepts from a number of competency lists.

[‡] These competencies were added on the basis of the authors' review of 153 competency lists. The sources from which the "new" competencies were adapted are cited. RC indicates that at least one was a specialty/

subspecialty review committee's list of competencies. See Supplemental Digital Appendix

- 1 (http://links.lww.com/ ACADMED/A138) for the list of RC sources.
- § This domain is titled "Medical Knowledge" in the
- ACGME framework.^{16–18} The authors revised the domain name in this reference list to incorporate frameworks from other health professions.

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		1	1	1
		Advisory Committee	Consultation	Curriculum Committee
Kathie Amato, MBA	Managing Director for Education, Duke Innovation and Entrepreneurship Initiative; Deputy Executive Director, Leadership Education, Divinity School; former Associate Dean, Fuqua School of Business and founding director, Master of Management Studies		XX	
Kathryn Andolsek,	Assistant Dean, Premedical Education;	XX		XX
MD, MPH	Professor, Community & Family Medicine			
Brenda E. Armstrong,	Associate Dean, Director of Admissions,		XX	
MD	SOM; Professor, Pediatric Cardiology			
Ellen Baker	Executive Coach, Fuqua School of Business Career Development Center and SOM Masters of Management in Clinical Informatics		XX	
Lee D. Baker, PhD	Dean of Academic Affairs, Trinity College; Professor, Cultural Anthropology [Alt: Inge Walther, Assoc Dean]	XX	XX	
Rex Bentley, MD, PhD	Professor, Pathology; Director, Master of Health Sciences in Pathologist Assistant		XX	
Melanie Bonner, Ph.D.	Professor, Child & Family Mental Health and Developmental Neurobiology; Academic Development Director, SOM	XX	XX	
Edward G. Buckley, MD	Vice Dean, Medical Education, SOM; Distinguished Professor, Ophthalmology	XX		
Jennifer M. Carbrey, PhD	Assistant Research Professor, Cell Biology	XX		ХХ
Kyle Cavanaugh, MBA, MS, MEd	Vice President for Administration		XX	
Dona M. Chikaraishi,	Associate Dean, SOM; Professor	XX		
PhD	Neurobiology; Co-Director, MSTP			
Saumil M. Chudgar, MD, MS	Director, ICM; Associate Director, UME, Department of Medicine	XX		ХХ
Dennis Clements, MD, PhD	Dennis Clements, MD, PhD, MPH Professor, Pediatrics & Global Health Director, DGHI Medical School Programs Chief, Duke Children's Primary Care		XX	

Appendix 4 – MBS Program Development Advisors, Consults, and Resource Faculty

		Advisory Committee	Consultation	Curriculum Committee
Wanda Collins, Ph.D.	Director, Counseling and Professional Services (CAPS)		XX	
John Collison, PhD	Director, Global Learning and Development, Genworth Financial; former Associate Director, Duke Career Services		XX	
Joseph M. Corless, MD, PhD	Associate Professor Emeritus Department of Cell Biology		XX	ХХ
G. Ralph Corey, MD	G. Ralph Corey, M.D., Director Vice Chair for Education and Global Health, Department of Medicine		XX	
Maureen Cullins, MS	Director, Multicultural Resource Center, SOM	XX	XX	
John Dailey	Chief, Duke Police Department		XX	
Robert P. Drucker, MD	Associate Dean and Advisory Dean, SOM; Professor, Pediatrics		XX	ХХ
Deborah Engle, EdD	Director of Assessment and Evaluation, SOM	XX		ХХ
Henry S. Friedman, MD	Professor, Neurology and Surgery; Director, CAPE		XX	
Jane P. Gagliardi, MD, MHS	Associate Professor of Psychiatry and Behavioral Sciences; Associate Professor of Medicine		XX	
Deborah T. Gold, PhD	Associate Professor of Medical Sociology Departments of Psychiatry & Behavioral Sciences, Sociology, and Psychology: Social and Health Sciences	XX	XX	
Doyle G. Graham, MD, PhD	Consultant and former Course Director for Body & Disease, Duke-NUS Graduate School of Medicine; former Dean of Medical Education and Professor of Pathology, Duke School of Medicine; former Chair, Department of Pathology, Vanderbilt University		XX	
Colleen O. Grochowski, PhD	Associate Dean, Curricular Affairs, SOM	XX		ХХ
M. Dee Gunn, MD	Associate Professor, Medicine and Immunology		XX	
Melissa Harden	Acting Director, Parking & Transportation Services			

		Advisory Committee	Consultation	Curriculum Committee
Judith Holder, Ph.D.	Assistant Professor, General Psychiatry and Community & Family Medicine		XX	
Margaret Humphries, MD, PhD	Professor of History and Medicine		XX	
Joseph A. Jackson, MD	Assistant Professor, Pediatrics	XX	XX	XX
Emma R. Jakoi, PhD	Associate Research Professor, Cell Biology	XX	XX	
Charles Landis	Manager, Parking Services		XX	
Harold Leraas, MA Medical Sciences	MS2, Duke School of Medicine; Graduate, Loyola Special Master's Program	ХХ		ХХ
Michelle Lyn, MBA, MHA	Associate Director, Duke Center for Community Research; Assistant Professor and Chief, Division of Community Health in the Department of Community and Family Medicine		XX	
Michael E. McLeod, MD	Professor Emeritus, Medicine (Gastroenterology); Co-Director, PRACTICE course		XX	
Paul Micelli, PhD	Assistant Director, Career Center		XX	
J. Lloyd Michener, MD	Professor and Chair, Community & Family Medicine		XX	
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Andrew J. Muzyk, Pharm.D.	Assistant Professor Campbell University School of Pharmacy Clinical Specialist in Internal Medicine/Psychiatry Department of Pharmacy, Duke University Hospital		XX	
J. Victor Nadler, PhD	Course Director, Body & Disease; Professor, Pharmacology & Cancer Biology	XX		XX
Justine Strand de Oliveira, DrPH, PA-C	Professor and Vice Chair for Education, Community and Family Medicine; Professor, Duke School of Nursing; Affiliate Faculty, Duke Global Health Institute		XX	

		Advisory	Consultation	Curriculum Committee
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Maria Parker	Director, English for International Students		XX	
Alyssa K. Perz- Edwards, PhD	Assistant Dean, Trinity College; Director, CARDEA Scholars	XX		XX
Elizabeth F. Ross, DPT, MBS	Assistant Consulting Professor, Physical Therapy; PRACTICE course and SOM Capstone course			XX
Daniel C. Scheirer, PhD	Associate Dean and Director, Health Professions Advising	хх		
Daniel O. Schmitt, PhD	Professor, Evolutionary Anthropology; MD program Gross Anatomy Course Director	XX		XX
Randy Sears	Director of Operations, Master of Management in Clinical Informatics		XX	
Barbara L. Sheline, MD, MPH	Associate Professor, Community and Family Medicine; Assistant Dean, Primary Care and Director, Clinical Leadership Track		XX	
Sandra S. Stinnett, DrPH	Assistant Research Professor of Biostatistics and Bioinformatics Ophthalmology		XX	
Andrea B. Taylor, PhD	Associate Professor, Community & Family Medicine and Evolutionary Anthropology; Course Director PA program anatomy	XX		XX
Claire E. Terhune, PhD	Assistant Professor, Department of Anthropology, University of Arkansas		XX	
	 Formerly, Assistant Professor, Physician Assistant program; Primary instructor, Anatomy; Duke SOM	XX		xx
Anh Tran, Ph.D.	Assistant Director Community Health; Director, Master of Health Sciences in Clinical Leadership			
John Vaughn, M.D.	Director, Student Health		XX	
J. Matthew Velkey, PhD	Assistant Professor of the Practice, Cell Biology	XX		XX
Pamela Vollmer	Assistant Director, Master of Health Sciences in Pathologist Assistant		XX	

		dvisory Committee	consultation	Lurriculum
Dishard C. Mallaca	Associate Director of Admissions COM	4 U		0.0
Richard S. Wallace	Associate Director of Admissions, SOM		XX	
Sue Wasiolek, JD, LLM,	Assistant Vice President for Student Affairs;		XX	
EdD	Dean of Students			
Nancy J. Weigle, MD	Assistant Professor, Community & Family Medicine: Director, PRACTICE course	XX		XX
Leonard F. White PhD	Associate Professor Orthonedic Surgery:	XX		XX
	Director of Education. Duke Institute for			///
	Brain Sciences (DIBS)			
Christopher W.	Associate Professor, Infectious Disease &		XX	
Woods, MD, MPH	Global Health; Director of Graduate			
	Studies, Global Health Institute; SOM Brain			
	& Behavior Course Director			
William Wright-	Director, Duke Career Center		XX	
Swadel, MEd				
Linton J. Yee, MD	Associate Professor, Medicine; Associate	XX		
	Chair, SOM Admissions Committee			
Meredith N. Zosus,	Associate Director, Duke Center for Health		XX	
PhD	Informatics; Instructor, MMCi			
Appendix 5: Initial (2011) Professional Master's Degree Advisory Committee

Dona Chikaraishi, PhD Committee Chair Associate Dean, Biomedical Graduate Education

Dick Brennan, PhD Professor and Chair Department of Biochemistry Director, Molecules and Cells

Ed Buckley, MD Vice Dean for Medical Education

Colleen Grochowski, PhD Associate Dean, Curricular Affairs

Mimi Jakoi, PhD Associate Research Professor Department of Cell Biology Director, Normal Body

Sally Kornbluth, PhD Vice Dean for Research (now Provost)

Carolyn Mackman Chief of Staff Dean of School of Medicine

Victor Nadler, PhD Professor Department of Pharmacology & Cancer Biology Director, Body and Disease

Daniel C. Scheirer, PhD Associate Dean and Chief Prehealth Advisor Director, Health Professions Advising

Matthew Velkey, PhD Assistant Professor (now Assistant Dean, Basic Science Education, SOM) Department of Cell Biology

Leonard E. White, PhD Associate Professor Department of Community & Family Medicine, (now Department of Orthopedic Surgery) Director of Education, Duke Institute for Brain Sciences Director, Brain and Behavior Course

Appendix 6: Elective Course Descriptions

CLP-210. The Successful Clinical Leader. Primarily taught in a case-based format, this course offers a review and application of the fundamentals of leadership, management, strategy, and finance as they apply to decision making in administrative medicine.

CLP-211. Fundamentals of Healthcare Finance. This course provides a background to healthcare finance including basic corporate finance, financial and cost accounting, and investment. Students will develop sound financial management and budget planning skills.

CLP 213. Health Care Organization and Policy. This course considers the interplay of various elements of the US health care delivery system: finance, reimbursement, legislation, health professional workforce, individual consumers, population and public health. The history, sociology, current trends and projected future of US health and health care are reviewed and imagined in this multidisciplinary course offering.

COMMFAM-221C. Practical Clinical Nutrition. This course will cover the topics in clinical nutrition that will be of most use to medical students interested in primary care. Participants will have a chance to observe and practice interviewing and counseling skills. Topics will include weight management, eating disorders, diabetes, hypertension, cancer, pregnancy, middle age, elderly, and population-based nutrition.

INTERDIS-155b. Medical Spanish I. The Medical Spanish Elective (MSE) offers 1-2 hours per week of medical Spanish language classes to first year Duke Med students. Students are stratified based on incoming language level. In addition, course participants are expected to volunteer for a minimum of 10 hours in the Latino community in the local area. A notation of completion is added to the student's transcript. The notation is added only once after successful completion.

INTERDIS-156B. Medical Spanish II. The Medical Spanish Elective (MSE) offers 1-2 hours per week of medical Spanish language on -line classes with Interlingua to first year Duke Med students. Students are stratified based on incoming language level. In addition, course participants are expected to volunteer for a minimum of 10 hours in the Latino community in the local area. A notation of completion is added to the student's transcript. The notation is added only once after successful completion.

INTERDIS-330B. The Evolution of Bioethics in the 20th Century. This course will address important themes in Bioethics and how they evolved through the 20th Century. Issues will include the ethical conduct on human subjects research (including study of misadventures like the Tuskegee syphilis project); contemporary thought regarding end-of-life decisions; the effect of advancing technology on ethical reasoning regarding pregnancy (pre-natal genetic testing, the changing limits to viability of newborns, and

attitudes toward abortion); research in children; and the issues of public health like quarantine and the right to refuse vaccination.

INTERDIS-422C. Exploring Medicine: Cross-Cultural Challenges to Medicine in the 21st **Century.** The purpose of this course is to promote understanding the cultural background of the people of Latin America (particularly Honduras) and how that impacts the delivery of medical care. The course content is designed to facilitate understanding how art, history, literature, music, geography, ethics and religion influence the practice of medicine in the Latin American Culture. The Classes will be given by multidisciplinary faculty from Duke, Johns Hopkins and local experts. Medical Spanish instruction is included in each class to facilitate understanding the culture and facilitate encounters with Hispanic patients in our own environments as well as in Honduras. The course will be held as a 2-hour seminar for 10 weeks (begins in early January) with the trip to Honduras as an optional laboratory experience. There will be 20 hours of instruction.

INTERDIS-423C. Honduras Trip. A 10-day trip to Honduras is planned to begin the end of March with approximately 15 students invited. Interdis 422C is a prerequisite for this trip. A certain number of students with Spanish fluency are needed for the trip. Those traveling to Honduras will visit a local Honduran hospital and additionally provide medical care to patients during 6 days of the visit. A trip to Copan and an indigenous Mayan community is also planned. Permission of the instructor is required for the trip.

CRP-243. Introduction to Medical Genetics. Coverage is provided of the fundamental knowledge in human genetics and genetic systems of the mouse and other model organisms. Topics include: introduction to concepts of inheritance (DNA, chromatin, genes, chromosomes); the human genome (normal genetic variation, SNPs, comparative genomes, molecular mechanisms behind inheritance patterns, and mitochondrial genetics); mouse genetics (classical mouse genetics, genotype- and phenotype-driven approaches, QTL mapping); microarrays (expression, genomic, ChIP (chromatin IP on chip), bioinformatics and use of genome databases); genetic association studies (haplotype blocks, study design in complex disease and approaches to complex disease gene identification, pharmacogenetics and pharmacogenomics). Prerequisite: None.

CRP-252. Principles of Clinical Pharmacology I. This course provides a basis for understanding the scientific principles of rational drug therapy and contemporary drug development, with emphasis on pharmacokinetics, methods for drug analysis, drug metabolism, and pharmacogenetics. Topics include the physiologic and pathophysiologic factors involved in drug absorption, distribution, metabolism and elimination, determinants of variability in drug responses, inter- and intra-patient variability in pharmacokinetics/pharmacodynamics, and drug interactions. This course also provides an introduction to common pharmacokinetic and pharmacodynamic modeling approaches. Prerequisite: Basic knowledge of calculus.

CRP-253. Responsible Conduct of Research. This course explores a variety of ethical and related issues that arise in the conduct of medical research. Topics include human subjects and medical research, informed consent, ethics of research design, confidentiality, diversity in medical research, international research, relationships with industry, publication and authorship, conflict of interest, scientific integrity and misconduct, intellectual property and technology transfer, and social and ethical implications of genetic technologies and research. This course is designed to meet and exceed the NIH requirement for training in Responsible Conduct of Research.

CRP-257. Proteomics and Protein Biology in Medicine. Platform technologies and computational methodologies for protein profiling and interaction analysis are introduced. The platform technologies covered include mass spectroscopy, 2D gel electrophoresis, surface plasmon resonance, protein arrays and flow cytometry. Structural biology and high-throughput screening methods are also discussed. Prerequisite: None.

CRP-258. Principles of Clinical Pharmacology II. As a continuation of CRP 252, this course includes the topics of drug transport mechanisms and their relevance in pharmacokinetics and drug metabolism, dose response and concentration response analysis, biological markers of drug effect, and adverse drug reactions. In addition, emphasis is given to optimizing and evaluating the clinical use of drugs, as well as drug therapy in special populations (children, elderly adults, pregnant and nursing women). A special course module focuses on the processes of drug discovery and development, and the regulatory role of the FDA. Prerequisite: CRP 252.

CRP-264. Introduction to Immunology in Clinical Research. This course provides an introduction to basic concepts of immunology, clinical assessment of immune function, and the fundamental importance of immune mechanisms in human disease. Topics include innate and adaptive immunity, regulatory mechanisms, and inflammation. Translational techniques used in immune assessment are described in the context of relevant clinical examples. Emphasis is placed on the application of basic immunology to human diseases in oncology, infections, autoimmunity and transplantation. Prerequisite: None.

CRP-265. Molecular Biology Techniques. This course is an introduction to basic laboratory techniques in molecular biology. Through lectures and hands on laboratory experiments students are introduced to methods required to perform basic molecular biology techniques. Techniques covered in the workshop include polymerase chain reaction (PCR), Western blotting, nucleic acid isolation, cloning, protein expression and siRNA amongst others. No laboratory experience is required. Prerequisite: Permission of the instructor.

Appendix 7: Program Development Timeline

1. May 2011

Dean Andrews met with Ed Buckley, Sally Kornbluth and Dona Chikaraishi to initiate discussion.

2. June 2011

The advisory committee (*listed in Appendix 4*) consisting of Ed Buckley, Dona Chikaraishi, Dan Scheirer (Pre-health Advising Office) and first year course directors and related faculty and administrators met to begin planning. The outcome was that course directors were to consider how their courses might integrate into the curriculum and Dona was to consider marketing strategies.

3. Aug 31, 2011

The advisory committee met again and reviewed marketing strategies and curriculum.

4. Sept 15, 2011

Decision was made to bring the proposal for a professional MS degree to the Chancellor's academic cabinet. With their approval, Ed Buckley and Dona Chikaraishi will seek a director. The director may need to hire an assistant and be full time as the program nears its launch.

5. Oct 29, 2011

Victor Dzau approved going forward with the degree.

6. Nov 1, 2011-Spring 2012

Fuqua Small Business Consulting team prepared and presented marketing analysis, which suggested that the program was financially viable.

7. Spring 2013

Director of program identified; begins background work to jumpstart proposal and curriculum development.

8. May-June 2013

Preliminary discussions with members of initial Advisory Committee and resource faculty begin.

Literature review regarding effectiveness of post-baccalaureate premed programs initiated.

Review of existing materials and information.

9. July 1, 2013

Director (Linda S. Lee, Ph.D.) begins full-time appointment as Director of Master of Biomedical Sciences program.

Drafting formal proposal begins.

Curriculum working group assembled.

10. July - December, 2013

Prepare formal proposal. Meeting of Curriculum Advisory Group – August 15

11. October, 2013

Meetings of Curriculum Committee continue – October 8 and 10 Appointment of Executive Committee members – Kathryn Andolsek, MD and Leonard White, PhD.

12. November, 2013

Meetings of Curriculum and Executive Committees continue. Proposal for Basic Sciences Faculty Steering Committee and Clinical Sciences Faculty Council completed.

13. December, 2013

Presentations to Basic Sciences Faculty Steering Committee and Clinical Sciences Faculty Council Executive Committee meetings continue. Responses to CSFC questions prepared.

14. January, 2014

Endorsement received from Basic Sciences Faculty Steering Committee. Return visit and discussion with Clinical Sciences Faculty Council. Executive Committee meetings continue.

15. February, 2014

Proposal revisions continue. Contacts with key campus services and potential elective course faculty. Executive Committee meetings continue. Curriculum Committee meetings continue.

16. March, 2014

Medical Center Executive Committee– March 11 Clinical Sciences Faculty Council – endorsement received Proposal submitted to Masters Advisory Committee – March 31

17. April, 2014:

Masters Advisory Council subcommittee review and report – April 15 Questions forwarded to MBS Director – April 22 Presentation to Masters Advisory Council and response to questions from April 15 meeting – April 30

18. May-July, 2014:

Course directors finalized; begin course development. Proposal revisions continued.

19. July 1, 2014:

Appointment of Assistant Dean for Premedical Education, Kathryn M. Andolsek, MD, MPH effective. Proposal revisions continued.

20. August 27, 2014:

Revised, complete proposal submitted to Professors Fox and McClain, Co-Chairs of the Masters Advisory Council.

21. September 24, 2014

Unanimously endorsed by the Masters Advisory Council.

22. Review at Academic Program Committee (APC)

10	Peer Institutions/Medical Schools									
do	Ins	titution	Type of program	Program Focus						
Ĕ		Program host unit	Degree/certificate	Acad enhancer	Career changer	Under rep/disadv				
	Case Western	School of Medicine	MSs in App. Anat, Med.Physiol, Pathology	х	x	x				
V	Chicago, U of	Does not offer program								
V	Columbia	School of General Studies	 1 – One year - Certificate in Premedical Sciences 2 – Two year programs - MSs in Bioethics, Nutr; MPH 	x	x	X				
	Cornell	Continuing Studies and Div. of Nutritional Sciences	Non-degree	x		x				
V	Harvard	Extension/Cont Ed	Non-degree	Х	Х	Х				
٧	Hopkins	College of A&S	MS in Biotechnology	Х	Х					
V	Michigan	School of Medicine	MS Applied Physiology	Х		Х				
٧	Penn, U of	College of Liberal & Professional Studies	Non-degree	Х	х					
	Pittsburgh, U of		Does not offer	r program						
	Rochester, U of	College of Arts, Sciences & Engineering	Non-degree		x					
V	Stanford U	Does not offer program								
v	UCSF	1- School of Medicine, UC Berkeley Extension, California PostBac Consortium	1-Certificate program; limited to California residents			X				
	Wash II	2 – School of Medicine	MS in Biomedical Imaging	x	x					
V	vvdSII U	(A&S)	Certificate	Х	X	Х				
V	Yale U	Does not offer program								

Appendix 8 – Peer Institutions – "Top Ten Plus"

Appendix 9: Screen Captures – Selected Programs

http://www.bumc.bu.edu/gms/gateway/prospective/masters-in-medical-sciences/



M.S. in Medical Sciences Program



The M.S. in Medical Science Program (MAMS) introduces students to a broad range of topics in the medical sciences while strengthening their academic credentials for admission to medical, dental or other professional schools.

The MAMS program is a 32 credit program that can be <u>completed in either one or</u> <u>two calendar years</u>. All students begin the program in September. The curriculum and tuition for the program are identical for both the one and two year options. A laboratory or literature-based thesis is required and many students elect to complete the program in two years, using the second year to gain valuable research experience.

In addition to coursework in the medical sciences, students may also opt to pursue interests in other areas such as Public Health, Mental Health Counseling and Behavioral Medicine or Clinical Investigation by entering a <u>dual degree or concentration program</u>. We also offer a <u>M.S. in Oral Health Sciences degree</u> for students who are specifically interested in dental medicine.

For more information please contact: <u>Gwynneth Offner, Ph.D., Director</u> 🖂

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http://advanced.jhu.edu/academics/graduate-degree-programs/post-bacc-healthscience-intensive/



http://graduate.wfu.edu/admissions/BMSC.html



. Thoris

Appendix 10: Duke Master of Biomedical Sciences (FAQs)

9-12-2014

What is the Duke Master of Biomedical Sciences (MBS) degree program?

The MBS is [will be] an 11-month professional degree [to be] awarded by the Duke University School of Medicine. It will enhance the scientific and professional preparation of students aspiring to a career in the health professions or in a related field requiring a background in integrated biomedical sciences. This will be accomplished by providing a combination of graduate level coursework, immersive patient-centered service learning, advising, and professional skill development.

What are the components of the MBS?

The academic program of study entails:

- Integrated graduate level courses in the biomedical sciences and EMT training;
- Graduate level study incorporating emerging areas of emphasis in medical education;
- A skills-based professional development curriculum centered around communication, collaborative problem-solving, and teamwork; and
- Individualized elective options.

The concurrent co-curriculum consists of:

- Customized advising, mentoring and career exploration;
- Guided preparation of applications to medical or other health professions schools;
- An option for pre-matriculation advising;
- Opportunities to develop relationships with students and faculty in a variety of health professions and related careers.

Program goals will be modeled and reinforced through instructional modalities shown to promote academic achievement, critical thinking, scientific inquiry, team skills, capacity for improvement, and cultural competence. These include team-based learning, co-mentored small group seminars, service learning experiences, simulations, critical reflection, and narrative writing.

What are the degree requirements and length of study?

The degree requires a total of 38 credits; of these, eleven courses comprise a required core curriculum of 33 credits. The remaining five credits are earned by completing one of two options for an individualized concentration: five credits of approved elective coursework or a mentored research/focused study project resulting in a written capstone paper for which five credits are awarded.

Students will be full-time; program completion requires a minimum of two semesters plus one summer term, starting with University Summer II term start date and ending the following May. Students whose concentration includes a research project may elect to extend their program of study for up to one year without incurring additional charges for tuition.

The student time commitment is estimated to be, on average, 20-22 hours per week of "programmed" activity and 38-40 hours per week of preparation and study for a total effort for

success in the program of approximately 60 hours per week.

MBS Term I		MBS Term II				MBS Term III					
Jul Au	ug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Human Structure (5)		Cellular Sciences (5)				Systems Sciences (5)					
EMT- Cert	-B Ti tifica	raining & ation (4)		EMT clinical	EMT clinical	EMT clinical	EMT clinical	EMT clinical	EMT clinical	EMT clinical	
Medical A & Science Prosemina (2)	arts es ar I	ts s Medical Arts & Sciences r I Proseminar II (2)				Medical Arts & Sciences III Proseminar (2)					
				Medical S (1)	tatistics	Quality Measurement & Management (3)					
		Discovery/Current Topics/Journal Club (2)				Discovery/Current Topics/Journal Club (2)					
No elective MBS Term	res n I	Elective component: Option 1: Research/focused study- 2 semesters (5) or Option 2: Approved graded coursework (5)									

The students' program of study will follow this sequence:

What is the intellectual basis for the degree?

The intellectual basis for the degree and its program of study is grounded in Boyer's conceptualization of intellectual life as a broader experience that includes the scholarship of **integration/synthesis**, of **application/engagement** and of **teaching**, in addition to the scholarship of **discovery**.

The Duke MBS is focused on graduate level intellectual development. Rather than borrowing a teaching philosophy from the medical school curriculum exclusively, it borrows from the pedagogical approaches used in more traditional graduate programs. By engaging faculty with PhDs who have been active in doctoral programs on the Duke campus, the program proposed here is not simply a "short version" of a medical school. It is instead a curriculum that focuses on development of inquiry, an understanding of complexity, and ways in which to develop knowledge through directed readings and seminar-style discussion.

What is an example of the intellectual basis for the MBS as illustrated in one of the courses?

The course—Human Structure—as an example demonstrates the intellectual basis of the MBS. Human anatomy has a tendency to become simple content delivery in which facts about anatomy are presented in a rigid fashion. This unfortunately misses a central point of inquiry based learning in anatomy: that there are guiding principles (i.e. mechanical, genetic, epigenetic, and phylogenetic) that inform anatomical arrangements. Students in this program will learn those principles and apply them. This will be true in physiology and neurosciences as well. This approach allows our students to encounter new material with facility and apply larger principles to knowledge construction throughout their lifetimes. Moreover, although anatomy is always treated as if all information were known, there remains considerable variation and ambiguity; we often understand where things are but their functional relationships are unknown. We will discuss what is known, what is not known, and most importantly what we would need to do to fill in these gaps. That approach demands the use of primary literature and critical thinking and evaluation. An approach that examines what is poorly understood encourages students to go beyond the surface of their learning. It also encourages students to consider pathways in research. In the end these approaches will be applied to real-world problems. This will be made possible through the combined didactic, seminar, and team-problem-solving structure proposed. That approach embraces the intellectual principles that this Masters program is about inquiry and understanding rather than simply knowledge acquisition. The EMT course will be sequenced with and integrated into this course. The application of course content to the real world experiences of caring for patients as an EMT will consolidate learning, identify additional gaps in "what is unknown" and prompt further inquiry.

What is the plan for advising the students?

Each student will be assigned to a faculty adviser who will participate in the student's onboarding activities and intake assessment process, guide the development of the student's required Action Plan, and in partnership with the assigned OHPA adviser, provide academic guidance throughout the program, including approval of the student's options for the elective component of the program. Students accepted into the MBS who plan to apply to medical or another health professions school will be offered a pre-matriculation advising option to ensure that those students understand the application process and are on track to prepare for the various application deadlines during their program of study.

The advising team will include faculty who represent MD, PA, PT, and Pharm D, nutrition, and PhD. Disciplines, and individuals with substantial experience in career services, health professions advising and student learning differences.

Who is the target audience for this program?

This program targets students who have completed premedical/prehealth curricula, who wish additional time to explore potential health careers, be guided through an application process to health professions schools, and/or strengthen academic and professional credentials for admission to health professions schools or entry into the workforce.

We believe some doctoral students may find the a useful "second degree" in developing clinical correlations for their science, which may be useful to them in identifying areas of translational research.

What are the admissions criteria?

Applicants who are a good fit for the MBS will already be good candidates for admission to a health professions school, so a baccalaureate degree from an accredited institution and medical/health professional school prerequisites must have been completed prior to matriculation. Applicants must have earned a minimum G.P.A. of 3.2 on all undergraduate and

post-baccalaureate work, and if taken, a minimum score of 25 on the MCAT within the last three years.

What are the benefits for those students who do not go on to medical/health professions schools?

Students will learn the language of human medicine (e.g. anatomy and biological systems) as well as the context of clinical care (e.g. the providers' perspective, health delivery systems). The vocabulary, perspectives and first-hand experiences will be useful in careers such as research, law, journalism, regulatory affairs, pharmaceuticals, medical writing, performance improvement, health professions teaching, etc. as well as careers emerging during continued implementation of the Affordable Care Act.

How will students manage the additional financial burden?

In keeping with existing School of Medicine practice, the program will direct a portion of its revenues (15% initially) to scholarship support for selected students, particularly underrepresented minorities (URMs) and first generation college students. Students in the program also will be eligible for federal financial aid. In addition, the professional development component of the curriculum will include financial planning and debt management. Long-term plans call for cultivating industry support for internship placements.

Most established Special Masters Programs do not offer any scholarship support. We believe that we will be able to foster diversity in our program at a level comparable to our medical student program, a leader among medical schools in diverse representation of URMs.

In addition, course content for Medical Arts and Sciences will include seminars on financial and debt management. MBS Students will attend workshops held twice yearly on campus and have access to an educational list serve run by a consultant who previously worked with the AAMC in student financial services. They will have the option of one on one consultation. The School of Medicine currently provides these resources for all MD, PA, and PT students, and the residents and fellows.

How does the Duke MBS differ from existing programs?

The proposed program is a professional master's program that is often referred to as a "Special Masters Program" in the premedical advising and medical education communities. Programs with similar goals, duration, and academic load include:

- John Hopkins University Post-Baccalaureate Health Science Intensive Program: Master of Science in Biotechnology
- Wake Forest University MBS: Master of Science in Biomedical Science
- Tufts University MBS: Master of Science in Biomedical Sciences
- Loyola University (Chicago) MAMS: Master of Arts in Medical Sciences
- Rosalind Franklin University BMS: Master of Science in Biomedical Sciences
- Georgetown University Special Master's Program: MS in Physiology
- Georgetown/George Mason Special Master's Program: MS in Biomedical Sciences
- Icahn School of Medicine at Mount Sinai MS: Master of Science in Biomedical Sciences

Features of Duke's MBS that distinguish it from other programs include:

- Gross anatomy with cadaveric dissection laboratory, integrated with other biological sciences and the EMT curriculum;
- EMT training, certification, and duty experience on community EMS squads;
- Courses designed specifically for and dedicated to MBS students;
- Located within School of Medicine on campus of academic medical center;
- Team-based learning and small group proseminars; and
- Program-based scholarships

How will Duke's reputation as an institution be enhanced by this new program?

The Duke School of Medicine (SOM) enjoys a reputation for educational innovation, and has been at the forefront of educational innovations that are now considered mainstream in medical and health professions education. The proposed program is another example of such innovation. It embeds *pre-professional* students within health care teams as care providers rather than as observers, captures the best elements of two specialized master's degree approaches, and adopts a pedagogy (team-based learning) that promotes skills desired in the health care systems and scientific workplaces of the future.

The program will provide rich opportunities for continued scholarship around the application and evaluation of innovative educational strategies thereby advancing evidence-based educational practices in the health professions. It will also enable us to address the existing deficit in the professional literature regarding this population of learners, especially those who pursue non-physician careers.

Questions?

For more information, contact:

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Appendix 11: Response to Clinical Sciences Faculty Council January 23, 2014

Master of Biomedical Sciences (MBS) Clinical Sciences Faculty Council - January 23, 2014

- Concept and Rationale
 - An advanced degree to go on and get an advanced degree?
 - Increasingly noted by Admissions Committee members, it's becoming the "new normal" for medical school applicants.
 - The AAMC website lists over 157 post-baccalaureate premedical and special masters programs (SMP) offered by 123 institutions; 96 of these programs are graduate level. In NC, Wake Forest, UNC Greensboro, Meredith College, and NCSU have some sort of program; only NCSU awards a master's degree (MS in Physiology). (page 7)
 - Peer institutions with Special Masters Programs include Case Western, Columbia, Hopkins, Michigan, and UCSF. Of these, Case Western, Michigan and UCSF programs are in schools of medicine. (page 25)
 - Enrollment at identified competitors: Boston U (150+), Georgetown SMP (100+), Tulane (5 programs, ~100 total), Michigan (20-25), NY Medical College (25), Hopkins (30). (page 27)
 - MBS will focus on "content" and "team" based learning critical for the team environment of the future system of health care and the development of critical reasoning
 - Is this worthwhile to do? Won't the students get this same academic content when they get to med school?
 - Some of it, perhaps, but the program will give students a leg up increasing the probability of a strong and successful start to the UME experience.
 - Foundation for success in medical school features preparation for medical education other than academic content, including strong advising, preparation for application, service learning, guided self-reflection on their experiences and academic skill development.
 - Elective/selective opportunities to allow students to individualize learning
 - New MCAT emphasis maybe allow strategic strengthening of pertinent skills:
 - Natural sciences sections of the MCAT2015 exam reflect recent changes in medical education, with a greater emphasis on cellular and molecular sciences.

- Addition of the social and behavioral sciences section (Psychological, Social and Biological Foundations of Behavior) recognizes the importance of socio-cultural and behavioral determinants of health and health outcomes.
- New Critical Analysis and Reasoning Skills section reflects desire of medical schools to attract well-rounded applicants from a variety of backgrounds.
- Market/target population
 - What is the market? Why target students who failed on their first application to med school? Is this the appropriate target population for the program?
 - Initial target = pool of repeat applicants whose MCATS and GPAs overlap with those of successful applicants.
 - Poor advising and lack of preparation in biographical writing and interviewing hinder many applicants, not necessarily academic shortcomings.
 - Strengthening academic portfolio of desirable candidates "on the bubble," especially URM and First Generation students.
 - The "new normal" model for undergraduate preparation demonstrates a growing market for students prior to their first cycle of medical school applications.
 - Targeting a known population to provide focus for curriculum development, anticipating that as the program grows, it will be attractive to others interested in health related careers.
- Program Impact Students
 - What are the benefits for those who do not go on to medical/health professional school? What happens to students these students?
 - Students will have learned the "language" that will be useful in other careers such as research, pharmaceuticals, medical writing, performance improvement, health professions teaching, etc.
 - Other programs report: students may self-select (wisely) out of medicine, some go into research careers or a different health field than first thought
 - ACA may create "new careers" not yet envisioned--population management, health coaches, etc.
 - > How will students manage the additional financial burden?
 - Program will offer limited scholarship funding
 - Eligible for federal financial aid
 - Financial planning will be included in the curriculum

- Program Impact the Faculty
 - How will this program impact current faculty?
 - Likely a short-term burden on some, but a long-term benefit
 - Desirable outcome may be to stabilize and strategically grow a cadre of "medical teaching faculty"
 - > Will faculty be compensated for teaching in this program?
 - Yes
 - Where will the faculty come from existing or new hires?
 - Mostly, existing faculty will contribute, but there is potential to recruit new faculty to the program facilitating education in this program and contribute to other health professions educational initiatives within the School of Medicine
- Program Impact the University
 - How will this program benefit the University beyond bringing in revenue?
 - Enable SOM to build and support a core of teaching faculty
 - Expand University's reach in premedical/health education
 - Strengthen collaboration between SOM and Trinity College in premedical education
 - Optimize premedical background for desirable URM and First Gen students
- Program structure, level and rigor
 - Is this a watered down version of medical school?
 - No, it is a foundational program
 - What will be the prerequisites?
 - Essentially, MCAT preparation; the target population already has prerequisites for medical school, including MCATs
 - How much of the curriculum will be online?
 - The portions that are appropriate for flipping the classroom in a team-based learning format will be online; but combined with small group team exercises
 - Strong experiential components and advising comprise a significant portion of the program.
- Program evaluation
 - What are the metrics for success?
 - Students academic performance and % awarded degree
 - Graduates' admission to medical (or other) health professional schools within
 2 years of degree completion OR graduates' identification of alternate career

path and successful redirection. (It is as important for students to discover medicine is "not their calling" without additional years expense in education/training.)

- Adequate financial margin to support teaching faculty
- Program reputation
- Quality of applicants
- Establishment of linkages with other medical schools/health professional schools facilitating graduates' admission
- Cadre of health professions educators for Duke

Appendix 12: Response to Master's Advisory Council April 30, 2014

Masters Advisory Council Questions in italics

1. Market for the degree

a. Please discuss the target student for the degree. The proposal (p. 3) claims that it is for post baccalaureate students who have completed a premedical/prehealth curriculum and want to enhance their credentials for admission into

- Health professions
- Biomedical science graduate study, or
- Workforce entry.

This seems like a very broad target audience. Could you explain how the program will meet the needs of all three of these student groups?

Initially, we expect that most of our applicants will be individuals who intend to apply or to reapply to a heath profession (MD, DO, PA, DPT, NP) program. Based on the experiences of other programs and the success of Professional Science Masters degree programs, we believe that as the program matures, it will also attract students who desire additional preparation for a wide range of related biomedical careers. These include teaching, industry, research, policy, business, disaster preparedness, and Homeland Security as well as completely new careers introduced by the disruptive opportunities resulting from full implementation of the Affordable Care Act.

Health Professions

Our initial focus on applicants and re-applicants to medical school is intentional and influenced by:

1. A large and identifiable existing potential applicant pool with known entrance characteristics

- a. Anticipated student prototypes: [*description of prototypical students and role of curriculum components*]
 - "Near hits" The high end of the unsuccessful applicant pool; those who failed to gain entry to medical school on first application, but whose MCAT scores and grades overlap with those who did. This pool's numbers have ranged from over 11,000 to 13,000 over a fiveyear period, according to data obtained from the AAMC by Professor Dona Chikaraishi and the original program Advisory Committee.
 - ii. Graduating college seniors aiming for medical school. Strong science background but inadequate clinical and service exposure.
 - iii. Graduating college seniors open to career exploration. Thinking of medical/health related careers but not yet sure.
 - iv. First generation and URM students, and others who are promising academically.

- 2. First time applicants to medical school increased from 24,884 in 2002 to 35,724 in 2013; Repeat applicants to medical school increased from 8740 to 12,286. https://www.aamc.org/download/321470/data/2013factstable7.pdf
 - a. Likely interest from the Duke undergraduate community. Anecdotally, a handful of Duke students learned about this proposed program and approached one of our faculty about starting it this summer! (Some are accepted into other masters' programs/post-bacs but would have preferred to stay at Duke.)
- 3. Earning a masters degree prior to medical school is increasingly becoming the "new normal" (approximately 25% of 2013 matriculants had earned masters degrees prior to entering medical school)
- 4. **Medical school enrollment (MD-granting and DO-granting combined) is projected to increase** by 8,851 first year students by 2018, an increase of 45% compared to 2002 (Results of the 2013 Medical School Enrollment Survey, AAMC, p.13).
- 5. **Our School of Medicine's experience** with existing courses and activities targeting the pipeline of future physician supply
- 6. Experienced health professions education **faculty who are excited** about the education program
- 7. **Intimate knowledge of this domain** and what is needed to be successful

Biomedical Science Graduate Study

A smaller cohort of prospective MBS applicants than the two mentioned above who aspire to careers in the health professions are those who are preparing to pursue specialized graduate study in the biomedical sciences. Increasingly, doctoral programs in the life sciences have curtailed the foundational sciences in their core curricula, placing additional burden on pre-graduate preparations for their successful matriculants. However, many potential doctoral students are not broadly educated in the anatomy and physiology of the human body, and even fewer have significant exposure to the health professions that provides the principle context for translation in biomedical research. The proposed MBS curriculum provides such students—especially those interested in translational science the opportunity to apply to doctoral programs with the benefit of a strong foundation in the cellular and systems sciences. Moreover, these students will benefit from the discipline and professional formation associated with health professions education, which should inform a broad understanding of the context for advanced studies in the biomedical sciences.

Work Force Entry

- 1. Core courses will provide exposure to the biomedical sciences, experience as a member of the health care team, and exploration of personal strengths for career opportunities.
- 2. Faculty from multiple health care professions will serve as instructor role models and advisors. Electives will help students explore potential interests in new fields.

- 3. Course work will provide an additional year of strengthening in advanced, integrated sciences.
- 4. The EMT experience will provide professional formation, identity, and experiences as a critically important member of the health care team. Patent care experiences will expose students to the complexity of the health care system and the multiple existing and emerging roles required to better serve patients. Reflective experiences will facilitate an understanding of the biopsychosocial and ethical issues.
- 5. The combination of experiences will provide a solid foundation for students entering careers in policy, disaster preparedness, homeland security, industry, quality control, teaching, research and journalism.

b. Later, the proposal states that the primary target audience is re-applicants to medical school, which provided some confusion during our discussion. For the medical school re-applicants, there was considerable discussion about whether or not a student from this program would likely be admitted to Duke's Medical School.

We anticipate that a select few of the individuals in our program will be strong Duke candidates as:

- 1. Duke School of Medicine (SOM) currently admits students from other similar programs (e.g. Loyola, Boston U, Georgetown)
- 2. SOM faculty involved in the admissions process will have an early look at promising under-represented minority students (URM) and first generation students who would be considered for admission
- 3. Students who achieve a predetermined standard of performance and who apply to Duke SOM will be offered interviews

Could you discuss how advising will work for these students, Will the program help students with the MCAT and application process to medical school?

The Program will provide extensive assistance with and coaching for the application process to medical or other health professional schools. It will provide resources for MCAT preparation for those students who have not already taken it or wish to retake in an attempt to improve scores. It is anticipated that this advising will be highly individualized based on each student's strengths and aspirations. As such, we anticipate having relevant advising for students who are re-applying to medical school.

Students will be assigned an advising team with a minimum of two members:

- 1. Office of Health Professions Advising (OHPA) adviser supported by the MBS (new position with a per cent effort budgeted by MBS)
- 2. SOM faculty member adviser
 - a. Duke graduates Leonard White, PhD, MBA Scientific Director
 - b. URM/First generation students Maureen Cullins, Director of SMDEP (Summer Medical and Dental Education Program)

- c. All Others: Kathy Andolsek, MD, MPH, Assistant Dean for Primary Education
- 3. The advising team will interact on a regular basis to make sure their areas of expertise are incorporated into each student's plans.
- 4. For the first 2-3 years of the program, every student will meet individually on a quarterly basis with Dr. Andolsek, the MBS Medical Director and effective July 1, 2014, the Assistant Dean for Premedical Education.
- 5. Academic and counseling support will also be provided by the SOM academic support director, Melanie Bonner, PhD, at per cent effort budgeted by MBS.

What will be the likely Medical School opportunities for graduates of this program?

- 1. Each individual student will be advised regarding the best "fit" from the pool of US medical schools (141 MD degree granting and 30 DO degree granting), based on incoming assessment, performance during the program, and exit assessment upon graduation.
- 2. Once the MBS establishes a track record, specific institutions will be approached to consider establishing formal "linkages" through which students who achieve set criteria would be guaranteed interviews, and in some cases, admission.

c. There was considerable discussion about how this degree would fit in with the Medical School admission and matriculation process. Could you give a timeline for how this would work for a student starting in Summer 2015? If admitted, when would the student enroll in Medical School? Is there a gap between the BMS and MD? If so, what does the student do during the gap?

The experience of other programs tells us that our students will likely fall into two categories: those who intend to apply for medical school during their year in the MBS program, and those who intend to take an additional "gap" year after the MBS program. The following figure outlines the timeline for students who apply to medical school concurrently with the MBS.



In those who take a gap year typically work e.g. as teaching or research assistants or obtain additional service experience to strengthen their credentials while they prepare their applications. The Program is committed to working with the students and to coach them in their application process for 2 years following graduation.

d. Please explain the EMS/EMT part of the program. Why is it critical? How will it help a medical school applicant? Are there clinical hours? Are students in the program expected to cover shifts?

Medical and other health professions schools expect applicants to have completed some experiences working with patients or providing service in a medical- related environment. These experiences add depth to the applicants' life experience and make them more knowledgeable about life as a health professional and some perspective on the patient experience. Increasingly medical schools expect their incoming students to have done more than simply "shadow" a physician or other health care provider.

EMT work provides:

- 1. One of the few opportunities for medical school candidates who are not already licensed health care professionals, to follow protocol, **make real-time, real-world decisions** that impact the health status and medical course of patients who are often in ambiguous, complex situations.
- 2. **Professional formation** as a health care professional during which they function as a contributing member of a health care team, working alongside a wide variety of members of the health care team, and develop and demonstrate many facets of professionalism
- 3. **Development of authentic skills in teamwork**, communication, observation, and problem solving, all essential personal "competencies" desired in medical school applicants.

- 4. A **window to the health care system**, with its complex interplay of psychosocial, behavioral, and cultural factors that influence health and disease, patient access, and importance of the community that shadowing and other volunteer activities cannot provide.
- 5. A natural **clinical correlation** for the science academic course work in gross anatomy, cellular sciences, and human systems sciences.
- 6. Confrontation with **ethical challenges**.

The MBS students will be required to obtain certification as EMTs and once certified, to work a **minimum of one 12-hour shift per month** for the duration of the program. The monthly requirement is consistent with the requirements for students who "man" the Duke EMS squad/station.

e. The program description on p. 6, states that full enrollment is 40 students when the program is stable. Do you foresee enrollment exceeding this number of students?

This question motivated a review of the program's preliminary five-year plan and budget. As a result, we have revised our plan to demonstrate success and stability with steadily increasing enrollment from an inaugural class of 20-25 students up to 50 by year five. We believe the numbers could well be expanded beyond that number, pending annual evaluations and periodic comprehensive program reviews planned for years three and five. Expansion will be considered carefully and will be based on assurances that appropriate faculty, staff, and facilities are available to support an expanded student body.

f. What type of loan arrangements will be made?

As full time students in a degree program, MBS students will be eligible for the same financial aid programs as other full-time masters students at Duke. Qualified students may be eligible for unsubsidized Federal Stafford Loans up to \$20,500, and the Grad PLUS Loan up to the cost of education. The unsubsidized Federal Stafford Loan interest rate is a fixed rate loan at 5.41% percent currently. The Grad PLUS loan is fixed at 6.41% percent currently. Interest rates for loans to be disbursed after July 1, 2014 are not yet available. The rates are tied to the 10-year Treasury and will be available in June.

All accepted applicants for full-time study in the MBS program are automatically considered for limited tuition scholarships on a highly competitive basis from the Program. We have revised our projected budget to direct 15% of tuition revenue to scholarship support.

The MBS program includes programming in personal financial planning and debt management. Students (prospective and upon graduation) will be allowed to participate in the Financial Planning workshops conducted by Duke's Summer Medical and Dental Education Program (SMDEP). In addition, the SOM Financial Aid Office is developing specialized financial planning workshops for medical students in conjunction with the University's Director of Student Lending. These programs will be available to the MBS students.

Will the program be financially worth it?

Judging from the experience of other programs, students who complete these programs agree that the experience was not only valuable, but **invaluable**, in aiding them to achieve their goals. We are investigating the careers pursued by those who do not enter medical (or another health professions) school to determine the earnings potential of other careers.

The success and longevity of similar programs attests to the value of the degrees. Example competitors:

- Lowest tuition Tulane (~\$21,000 in 2012)
 - MS in Genetics
 - Entering class size typically 12-18
 - Medical school acceptance rate: 90% accepted within 2 years of completion
 - Program age = unknown; Tulane offers several such degree programs (tuitions range from \$21,000 to \$27,000; entering enrollments 12-35 per year) through the Biomedical Sciences
- Highest tuition Georgetown (~\$48,000 for AY2014-15)
 - Special Master's Program One year MS in Physiology
 - First year enrollment typically 100+
 - No scholarships, tuition waivers or grants available from GU
 - Medical school acceptance rate: 50% within one year; overall 80% within 2 years
 - Program age = 48 years
- Closest geographic proximity Wake Forest University Master of Biomedical Sciences, Winston Salem, NC (\$34,634 in 2013-14)

2. Structure of the degree

a. Please clarify the courses required, the number of credits per course, and show how it all adds up to the 36 credits required for the degree.

This question prompted a more thorough review of the program structure and the relationship between the required courses and elective curriculum. As a result, we have revised the program as follows to reinforce areas considered essential (e.g. statistics and Evidenced Based Medicine or EBM) and to tighten the elective component so that appropriate mentoring and oversight is provided.

Students must complete 36 credits as follows:

11 required courses: (30 credits)

Human Structure (4) EMT Training and Certification (4) Cellular Sciences (4) Systems Sciences (4) Management of Self/Professional Identity I, II, III (2 each; 6 total) Medical Statistics (1) Introduction to Evidence Based Medicine (2) Special Topics Journal Club (2) Quality Measurement & Management (3)

Elective courses and/or independent study (6 credits)

Option 1: Research/focused study for two semesters ("mini-thesis") (6) **Option 2**: Selected coursework. With permission of instructor/department and adviser approval (6)

MBS Term I		MBS Term II				MBS Term III						
Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May		
Human Structure (4)		Cellular Sciences (4)				Systems Sciences (4)						
EMT-B T Certific		raining & ation (4)		EMT clinical	EMT clinical	EMT clinical	EMT clinical	EMT clinical	EMT clinical	EMT clinical		
Prof D	ev I (2)		Prof Dev II (2)				Prof Dev III (2)					
		INTERDI	S 314B N	Aedical Sta	tistics (1)	Intro to EBM (To be developed) (2)						
No electives in MBS Term		Special/Current Topics Journal Club (2)										
		CLP 206 Quality Measurement & Management (3)										
 Elective Option 1: Research/focused study- 2 semesters ("mini-thesis" – finish by graduation 								tion) (6)				
	Elective											
Option 2: Selected coursework. (6)												
		with permission of instructor/department and adviser approval.										
		Examples of potential fall term				Examples of potential spring term courses:						
		COURSES				INTERDIS 130 Medical Spanish II (1)						
		INTERDIS 155 Medical Spanish I (1)				CRP Medical Genetics (2)						
		SOC 250 Medical Sociology (1) SOC 264 Death & Dying (1)				CRP 253 Responsible Conduct of Research (2)						
SOC 204 Deat			US Heal	th Disnarit	ies (1)	CRP 258 Principles of Clin Pharm II (2)						
CRP 252 Principles of C					harm I							
(2)												

b. The academic calendar is not aligned to the university academic calendar. Will this impact selective or electives options? Students will not graduate with the rest of the University; is this desired/necessary?

Most of the School of Medicine degree programs operate on non-traditional calendars, reflecting the learning experiences required by our pre-professional students:

- MD program each year of the curriculum has a unique calendar; none coincide with the University calendar
- Doctor of Physical Therapy program (DPT) 33 months from matriculation to graduation with 6 didactic "sessions" that do not all coincide with the University's academic calendar; plus as many as 3 clinical internship sessions.
- Master of Health Sciences-Clinical Research

- Master of Health Sciences -Pathologist Assistant
- Master of Health Sciences –Clinical Leadership
- Master of Health Sciences (Physician Assistant Program), year 2
- Master of Management in Clinical Informatics

The Program matriculation date is the same as the University's Summer Session II.

- This start date will enable the program to offer the Human Structure course (gross anatomy with cadaveric dissection labs).
 - This is a time period when the gross anatomy lab in the Davison Building is not in instructional use and is available for the MBS
 - It will allow the MBS labs to overlap somewhat with physical therapy and physician assistant students enabling some interprofessional student exposure (late August), and
 - This will be prior to the start of gross anatomy for medical students, at which time the lab is at capacity and unavailable for MBS instruction.
- The start date will also enable the students to begin EMT training concurrent with the gross anatomy course. Correlations between the two courses are planned as an essential component of the curriculum.

Impact of academic calendar on electives.

• Based on prior experience with the SOM's MHS in Clinical Research (assuming that individual class sessions do not conflict), students are able to enroll in and complete courses offered by other programs within the University's traditional academic calendar as well as the unique schedule of the Fuqua School of Business. Individualized advising will help ensure that students can attend classes and complete exams, or other requirements per that course's requirements, regardless of the MBS schedule.

Graduation date will be May:

• Our students will complete their coursework in accordance with the academic calendar and will participate in the University Commencement Exercises in May.

c. This is an on-campus program, but the proposal talks about flipped program. Could you explain more about how this will be implemented?

The term "flipped classroom" refers to an active teaching and learning teaching strategy. Prober and Health describe this in "Lecture Halls without Lectures — A Proposal for Medical Education" in the *New England Journal of Medicine* in 2012. (366;18 nejm.org may 3, 2012)

- Duke SOM began implementing this pedagogical strategy formally with the inaugural class of students at the Duke-NUS Graduate School of Medicine in 2007.
- Virtually all of the Duke SOM first year medical student curriculum and the Doctor of Physical Therapy curriculum incorporate the principles and practices of teambased learning as one means of utilizing the "flipped classroom" approach.

 Selected courses in a non-clinical masters program of the SOM (e.g. CRTP), utilize flipped classroom methods to maximize in-class active learning time in the study of statistics: "An Active Learning Approach to Teach Advanced Multi-Predictor Modeling Concepts to Clinicians" (http://www.amstat.org/publications/jse/v20n1/samsa.pdf).

The overall pedagogical framework adopted for the program is Team-Based Learning;

- Out-of-class time is devoted to viewing video tutorials, annotated presentations, and completing required reading assignments and preliminary exercises.
- Students come to class prepared to actively engage with the material. They complete and discuss with the instructor, readiness assessments on the material, individually and collectively, prior to proceeding with the class session activities.
- In-class time is highly participative, emphasizing individual responsibility and collaborative learning that challenges learners to apply their knowledge. Application activities include readiness assurances, discussions, clinical case studies, problem- solving in foundational sciences, anatomical dissections, physiological experiments, and group projects.

3. Faculty and staff support for the degree.

a. On p. 4, it states that early on existing faculty will be used to direct and teach the program's courses. Please outline how you intend to cover the new courses and how you will cover for the existing faculty that will allocate some of their time to teach in this program.

Faculty identified for key positions have already participated as part of the Program's Advisory and/or Curriculum Committees, They have been actively engaged in the program's development, and have agreed to course leadership and/or teaching roles.

The Vice Dean for Education, in the same manner in which medical student teaching is supported, will ensure the following:

- That the necessary faculty are appropriately and fairly compensated as they are in other SOM programs;
- That course directors and other instructors will be confirmed <u>prior</u> to student matriculation and documented appropriately;
- That adjustments in proportional effort to assume teaching responsibilities for the program will be approved by the faculty members' chairs/chiefs; and
- That all faculties will be in full compliance with effort reporting regarding their participation in the MBS program.

b. Please outline the administrative structure for the program. Be sure to indicate what will be covered by existing positions and the new positions that you expect to add.



There were also some items that do not need to be presented on April 30, but should be included in a revised submission.

We are providing responses to these items below and will clarify further in the revised submission.

4. Please provide letters of support for entities outside that School of Medicine that are identified as providing support to the degree. These groups include:

- a. Duke Career Services
- b. Office of Health Professions Advising
- c. ED/EMS group for EMT training
- d. Primary Care Leadership Program for service learning support
- e. Entities that agree to provide externships for MBS students,

f. And any other unit outside of the School of Medicine that might be substantially impacted.

- g. Dean Nancy Andrews--included
- h. Vice Dean Edward Buckley --included

We will submit all of the recommended letters of support with the revised proposal. Two letters from SOM administration are included with this summary: one from Dr. Nancy Andrews, Dean, School of Medicine and one from Dr. Edward Buckley, Vice Dean for Education.

5. As part of the assessment and evaluation process, please define a review point to assess progress of the new degree. This typically occurs after 3-5 years. Additionally, it is expected that master's degrees are reviewed periodically if there is not an external accrediting body. If the degree will not be externally accredited, then you should plan on performing an external review every 5-6 years.

The Leadership of the MBS is committed to a robust process of continuous quality improvement continuing a process that began with the initial needs assessment for the program. The needs assessment and initial planning included extensive literature reviews, a market analysis, key informant interviews, reviews of existing post baccalaureate programs, and exploration by the Chancellor's Enterprise Wide Planning Group.

- At the Program Level and as noted in the proposed Evaluation Plan:
 - Applicants who are accepted and choose not to matriculate will be surveyed regarding their reasons for non-matriculation and information regarding their future plans or chosen post-baccalaureate program
 - Courses will be evaluated with feedback to the professors and for ongoing enhancement
 - Characteristics of our student population will be tracked including the demographics of students who apply, matriculate and graduate.
 - Graduate outcomes will be tracked including the number who apply to health professions schools, acceptances, matriculation, future programs (such as residency training and professional plans).
 - In a manner similar to that used with our 80+ graduate medical programs, the MBS will constitute a Program Evaluation Committee that will conduct a yearly self-study. The results will inform the annual program evaluation and improvement plan.
 - The annual program evaluation and improvement plan will be submitted to the School of Medicine Masters' Oversight Committee.
- School of Medicine Review and Oversight
 - Most of the School of Medicine programs have an external accreditation body that require periodic self-study and provides oversight (i.e. LCME, in the case of the medical student program)
 - A School of Medicine Masters Oversight Committee will provide ongoing educational oversight to the educational Programs within the SOM that do not have an external accreditation body
 - Membership

- The Masters Oversight Committee will be chaired by the Director of Assessment for the SOM
- Membership will consist of senior leaders from each of the pertinent programs and a subset of representatives from the School of Medicine Programs which have an external accreditation body
- Additional members will include leadership from Duke AHEAD, Diversity, and Faculty Affairs.
- Each program will be reviewed a minimum of every three years. Action plans for improvement will be developed for each program; their implementation will be followed up as part of a defined timeline and tracked to completion.
- o University Review and Oversight
 - The MBS will be externally reviewed by the University in 5 years (2020) and then every 5-6 years per the policy proposed by the Masters Advisory Council, adopted and disseminated in October of 2013 by the University Provost.

6. On p. 6, it mentions this program as a potential option for advanced Duke undergraduates. A program including undergraduate students would require a separate review process through Trinity. Unless this is an essential element of the program, it is better to remove this from the proposal.

Noted: the reference to an undergraduate option for study in the MBS has been deleted from the proposal.

7. There were a few items in the budget that seemed inconsistent with other masters programs.

a. There is only \$5,000 budgeted for advertisement of the program. It will likely take considerably more funding to develop awareness for a new program.

The budget and five-year plan have been revised to direct \$10,000 to advertisement and recruiting for the first year of the program; this will be evaluated on a year-by-year basis.

b. One target applicant group was URM's and 1st generation college students, yet Financial Aid is only \$20,000. This would only provide a partial scholarship for 1 student. If this is an intended audience, then more funding will be needed.

The budget and five-year plan have been revised to direct 15% of tuition revenue (~\$105,000 in year one) to scholarship support for selected students. We anticipate growing the scholarship fund over the life of the program.

c. There is not any overhead from the Medical Center or from Duke University. This is usually a non-trivial percentage and should be budgeted when developing the financial model. As an educational unit of the School of Medicine, we do not pay for "overhead" per se, general or administrative costs. Allocations for OIT (\sim 2.03%) are assigned to individual budgets and will be included in the final budget submitted.

Edward G. Buckley, MD Kathryn M. Andolsek, MD, MPH Linda S. Lee, PhD Leonard E. White, PhD

April 30, 2014 kathryn.andolsek@duke.edu Appendix 13: Response to Master's Advisory Council August 27, 2014
Duke Master of Biomedical Sciences (MBS): Responses to Questions Posed by the Masters Advisory Committee April 30, 2014. 1. Why a "master's degree"? How is the degree sufficiently rigorous?

The October 2009 report of the Ad Hoc Committee on Masters Programs stated "the committee was unanimous in agreeing that there are many positive impacts from establishing new masters programs, ... and fulfilling the strategic initiative of knowledge in service to society. Such programs ... can provide a unique and valuable option for students from a career development perspective." (Wright JR. Duke University Graduate School. 2009)

The proposed Duke Master of Biomedical Sciences (MBS) will extend the reach and impact of Duke's highly recognized medical and scientific training programs to a talented population of students by first, filling a void that exists in our own pipeline of health professions training across the continuum, second, filling a void that exists among its peer institutions, and third by broadening opportunities for under-represented minorities and first generation college students in the health career pipeline at Duke. The MBS will enhance employment opportunities in the changing health care environment as a strategic initiative in service to the health of the public.

The MBS proposal also responds to faculty interest in expanding innovative interdisciplinary teaching opportunities and the need for scholarship in medical education.

The proposed program is a type of professional master's program frequently referred to as a "Special Masters Program" in the premedical advising and medical education communities. It is comparable in structure and load to similar programs at other schools including:

- John Hopkins University Post-Baccalaureate Health Science Intensive Program: Master of Science in Biotechnology
- Georgetown University Special Master's Program: Master of Science in Physiology
- Georgetown/George Mason Special Master's Program: Master of Science in Biomedical Sciences
- Icahn School of Medicine at Mount Sinai MS: Master of Science in Biomedical Sciences
- Loyola University (Chicago): Master of Arts in Medical Sciences
- Rosalind Franklin University: Master of Science in Biomedical Sciences
- Tufts University: Master of Science in Biomedical Sciences
- Wake Forest University Master of Science in Biomedical Science

Three of these programs, Johns Hopkins, Georgetown/George Mason and Wake Forest University have launched and enrolled students within the two years that have elapsed since Duke School of Medicine first began to design the MBS. Wake Forest's s program, the most geographically proximate, matriculates its first class in the fall semester of 2014.

The Duke MBS will be an 11- month professional degree [to be] awarded by the Duke University School of Medicine (SOM). The degree requires a total of 38 credits; of these, eleven courses comprise a required core curriculum of 33 credits. The remaining five credits are earned by completing one of two options for an individualized concentration: five credits of approved elective coursework or a mentored research/focused study project resulting in a written capstone paper for which five credits are awarded. Program goals will be modeled and reinforced through instructional modalities shown to promote academic achievement, critical

thinking, scientific inquiry, team skills, capacity for improvement, and cultural competence. These include team-based learning, co-mentored small group seminars, service learning experiences, simulations, critical reflection, and narrative writing.^{43,45,48,57-60,92-98}

The program's rigor derives in part, from the graduate level coursework and intensity of engagement required of students. The curriculum and key teaching faculty are drawn from our highly rated existing SOM graduate programs, including the Doctor of Medicine (a top ten US medical education program), the Physician Assistant program (number one national ranking) and Doctor of Physical Therapy program (ranked in the top 15% of over 185 US programs). Student time commitment is estimated to be 20-25 hours per week of "programmed" activity and 35-40 hours per week of preparation, clinical requirements, and study for a total of 60 hours per week during each of the 3 academic terms. In addition, fulfillment of required clinical components may entail working weekends, holidays, and during term breaks, as do students in the MD, physician assistant, and physical therapy graduate programs.

The program's rigor derives in part, also, from the intellectual basis and framework underlying the proposed program of study. The intellectual basis for the degree and its program of study is grounded in Boyer's conceptualization of intellectual life as a broader experience that includes the scholarship of integration/synthesis, of application/engagement, and of teaching in addition to the scholarship of discovery, and is focused on graduate-level intellectual development.³⁹⁻⁴² Rather than borrowing a teaching philosophy from the medical school curriculum exclusively, it borrows also from the pedagogical approaches used in more traditional graduate programs. By engaging faculty with PhDs who have been active in doctoral programs on the Duke campus, the program proposed here is not simply a short version of a medical school. It is instead a curriculum that focuses on development of inquiry, an understanding of complexity, and ways in which to develop knowledge through directed readings and seminar-style discussion. Taking one course—Human Structure—as an example allows us to illustrate this approach.

Human anatomy has a tendency to become simple content delivery in which facts about anatomy are presented in a rigid fashion. This unfortunately misses a central point of inquirybased learning in anatomy: that there are guiding principles (i.e. mechanical, genetic, epigenetic, and phylogenetic) that inform anatomical arrangements. Students in this program will learn those principles and apply them. This will be true in the integrated cellular, systems, and neuro sciences as well. This approach allows our students to encounter new material with facility and apply larger principles to knowledge construction throughout their lifetimes. Moreover, although anatomy is always treated as if all information were known, there remains considerable variation and ambiguity; we often understand where things are but their functional relationships are unknown. We plan to discuss what is known, what is not known, and, most importantly, what we would need to do to fill in these gaps. That approach demands the use of primary literature and critical thinking and evaluation. An approach that examines what is poorly understood encourages students to go beyond the surface of their learning. It also encourages students to consider pathways in research. In the end these approaches will be applied to real-world problems. This will be made possible through the combined didactic, seminar, and team problem-solving structure proposed. That approach embraces the intellectual principle that this program is about inquiry and understanding rather than simply knowledge acquisition. And research has shown that such an approach is an effective pedagogy and solidly grounded theoretically.^{45,46,94}

The Duke SOM enjoys a reputation for educational innovation, and has been at the forefront of educational innovations that are now considered mainstream in medical and health professions education. The MBS is another example of such innovation. It embeds *pre-professional* students within health care teams as care providers rather than as observers, captures the best elements of two specialized master's degree approaches, and adopts a pedagogy (team-based learning) that promotes skills desired in the health care systems and scientific workplaces of the future. The program will provide rich opportunities for continued medical education scholarship thereby advancing evidence-based educational practices in the health professions.

2. What will you do creatively about recruiting under-represented minorities (URMs)?

Our approach to ensuring diversity among our matriculating students is grounded in the vision and values articulated in the 2012 report of the SOM's Office of Diversity & Inclusion, "Charting the Path Towards Inclusive Excellence," which calls for weaving diversity and inclusion deliberately and intentionally into the School's culture. We began our path by first, intentionally building a leadership team that reflects the diversity we desire in our student cohorts. Secondly, we have created a financial plan that commits a minimum of 15% of tuition revenue each year to scholarships for students, a feature that sets our program apart from others. Thirdly, we believe that we can learn from the successful practices of the SOM's medical student and physician assistant student programs, which consistently matriculate 20% or more URMs in each entering class. In fact, the medical student program's minority recruitment rates have exceeded national averages since 1996.

In addition, we are collaborating with our extremely successful Summer Medical Education Program (SMDEP), conducted by the SOM Office of Multicultural Affairs. This program, one of only twelve in the country, targets talented prehealth college first- and second-year students who are disadvantaged, from underserved communities, are underrepresented minority, or interested in the health of the underserved. For the past twelve years, scholars from Duke's SMDEP have enrolled in medical schools (including Duke SOM), PhD programs, nursing schools, physician assistant programs, MPH programs and schools of law.

We will aggressively reach out to historically black colleges, including North Carolina Central University locally, and to organizations such as the Minority Association of Pre-Medical Students (MAPS), as well as to undergraduates who have contacted us regarding forming an undergraduate chapter of the American Medical Women's Association to provide additional support for women.

3. Is there sufficient time "To have an impact", to "Get to know the students"?

We believe the MBS provides substantial support for students' applications to a health professions school, whether they apply concurrently with the MBS or pursue an additional gap/enrichment year following graduation. The following figure outlines the medical school application process, typical in timing to other health professions schools.



For students who wish to apply to health professions schools concurrently during MBS matriculation, we have created a "pre-matriculation component." We will begin to work with students choosing this option immediately following their admittance and committed registration. From April through June, Dr. Andolsek and her team will provide individualized mentoring based upon the specific needs of the student. This may include coaching on various aspects of the application process; strategically selecting target health professions schools; establishing timelines; editing applications, personal statements, resumes and essays; and selecting appropriate individuals for the required letters of recommendation. The Association of American Medical Colleges (AAMC) on- line application service, AMCAS, is used by most American medical schools (selected Texas medical schools are the exception). AMCAS opens in early May, accepts submissions in early June, and electronically transmits materials to medical schools at the end of June. Schools then request "secondary applications," which are due later in the fall. Selected applicants are interviewed September through February.

Once students matriculate to the MBS on June 29, 2015, their advising will occur as a core component of the curriculum. The small cohort of students, the close working relationships between students and faculty, and the dedicated advising system will allow sufficient contact time to help them continue to build their resumes, respond to requests for secondary essays, and later to practice in standardized workshops a variety of commonly employed interviewing techniques. Course grades and narrative comments will be available to demonstrate the students' performance during the first two semesters of the MBS, enabling health professions schools to employ them in their admission decisions, which are made in March and April.

For students who plan to apply to health professional schools the year following their completion of the MBS, the program will help identify appropriate activities for their "gap year" and continue to work with them throughout their application process. Assistance with applications will be available up to 3 years following graduation from the MBS.

4. Where will the course materials come from? Existing lectures? Duke-NUS?

Course materials will be created specifically for the MBS students. The faculty selected for the MBS are already successfully teaching similar courses for Duke MD, PA, and PT students; a number are also engaged in premed course teaching at the undergraduate level. Many have

collaborated or are still collaborating with faculty from Duke-NUS. These faculty are cognizant of the unique educational needs and developmental stage of our targeted student population. They are excited to design appropriate graduate level courses that are integration among all of our program components. The course directors, supported by funds from SOM reserves, are already engaged in course development, in anticipation of the program's approval and matriculation of the first class in June of 2015.

5. You seem to target three different audiences; what will each type of student be able to do after completing this degree?

We believe the majority of our students will be aspirants to further health professions' education. Duke's Office of Health Professions Advising (OHPA) is aware of at least 15 Duke undergraduates who matriculate to these programs annually following graduation from Trinity and Pratt. In fact, six such students, without any advertising, approached members of the MBS leadership in May of 2014 wishing to begin this program this summer.

We also believe there is an audience among doctoral students in the sciences whose research career opportunities are currently limited by stagnation in the NIH budget. These students may enhance their career opportunities through participating in the MBS' breadth of integrated science and clinical experiences and position themselves optimally for translational research. One such student, without any advertising, approached Dr. Andolsek this summer and is working with him informally.

Each MBS student will receive individualized advising and assigned to a faculty adviser who will participate in the student's onboarding activities and intake assessment. This will include selected inventories such as the Myers-Briggs Type Inventory. These data will inform the preparation of each student's individual action plan, the roadmap to be used with the advisor to track progress toward the student's goals and toward completion of degree requirements. Advisers will partner with the OHPA adviser (supported by MBS) assigned to the MBS students and they will meet with their advisees on a regularly scheduled basis throughout the program to facilitate academic guidance and explore career options. The MBS team will also include a Career Services specialist who will provide one on one career guidance.

As a result of the MBS, some students will learn about and identify careers that better match their talents than a health professions career. MBS Students will learn the language of human medicine (e.g. anatomy and biological systems) as well as the context of clinical care (e.g. the providers' perspective, health delivery systems). The vocabulary, perspectives and first-hand experiences will be useful in careers such as research, law, journalism, advocacy, regulatory affairs, pharmaceuticals, medical writing, performance improvement, health professions teaching, etc. as well as careers emerging during continued implementation of the Affordable Care Act. Students will be exposed to alternative career opportunities through setting such as the evening career networking events sponsored by the Master of Clinical Informatics Program and campus wide career fair events sponsored by the Duke Center for Career Services. We have begun to partner with relevant employers to identify potential elective, internship, and career opportunities for students who decide not to pursue health professions careers. Tracking outcomes of our graduates will be critically important to inform our admissions policies and our curriculum.

6. Describe the electives and course numbers. Some of the course numbers suggest these are lower undergraduate level courses. The Committee wants assurances that faculty who would be teaching these electives have been consulted.

Our proposal includes at least 16 graduate level courses that are currently offered within existing School of Medicine medical and graduate programs, which if the program began "today," would be available to our students. Program directors and individual instructors have been consulted regarding the appropriateness of the selected courses, and letters of support/agreement are provided in Appendix 5 of the proposal. It is worth noting that a number of the faculty whom we approached have commented on their belief that the inclusion of the MBS student will enhance the educational experience for students and faculty alike. Regarding the Committee's concern regarding elective courses at the "200 level", it should be noted that the School of Medicine course numbering system differs from that used by the Graduate School, Trinity School of Arts & Sciences, Pratt School of Engineering, Nicholas School of the Environment, and Sanford School of Public Policy. For example, many courses in the Doctor of Medicine, Master of Health Sciences in Clinical Research, and Master of Health Sciences in Clinical Leadership have a 200 prefix; only the Master of Biostatistics program has renumbered their courses to reflect the new (effective 2012) numbering system. We have a sufficient number and variety of electives within the School of Medicine secured to implement the MBS program. We will continue our efforts, however, to expand elective opportunities to meet the individual needs and interests of our students through interdisciplinary collaborations in the greater University community. We believe interdisciplinary educational opportunities for graduate and other professional students would enhance our entire learning community, for our students and our faculty.

7. There were concerns about the content of the professional development course and whether medical schools ever teach anything like what was described. Is this content "academic"?

".... Professional development is at the heart of medical training...Professional development needs fostering as an integral part of all medical training, embedded in experience and associated practices." -Stephenson A, Higgs R, Sugarman J. Medical education quartet: Teaching professional development in medical schools. Lancet 2001;357;867-70

Academic course work required in medical school and other health professions necessitates extensive professional development. It is not only expected, but also required, by the various accrediting bodies for undergraduate medical education (Liaison Committee on Medical Education - LCME) graduate medical education, (Accreditation Council for Graduate Medical Education - ACGME) and continuing medical education (Accreditation Council for Continuing Medical Education).

In 2013, the Association of American Medical Colleges (AAMC) identified both a common taxonomy for competencies across the health professions and a standard set of professional competencies for physicians.⁴⁴ The eight competency domains are: Patient Care, Knowledge for Practice, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, Systems-Based Practice, Interprofessional Collaboration, and Personal & Professional Development. It should be noted that these eight competencies are not rank ordered: all are felt equally necessary for clinicians to perform their roles in contemporary

society. Within each of these eight, sub-competencies further delineate learner expectations. For example, within the competency of Personal *and Professional Development*, learners are expected to

- 1. Develop the ability to use self-awareness of knowledge, skills and emotional limitations to engage in appropriate help seeking behaviors
- 2. Demonstrate healthy coping mechanisms to respond to stress
- 3. Manage conflict between personal and professional responsibilities
- 4. Practice flexibility and maturity in adjusting to change with the capacity to alter one's behavior
- 5. Demonstrate trustworthiness that makes colleagues feel secure when one is responsible for the care of patients
- 6. Provide leadership skills that enhance team functioning, the learning environment, and the health care delivery system
- 7. Demonstrate self-confidence that puts patients, families, and members of the health care team at ease
- 8. Recognize that ambiguity is part of clinical health care and respond by utilizing appropriate resources in dealing with uncertainty

The importance of all of these competency domains does not end with "medical school". Six of these competencies, Patient Care, Knowledge, Practice Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism and Systems Based Practice were adopted for graduate medical in 1999. These six are also required for all board certified US physicians as part of the life long learning expected as they "maintain certification" over their professional lives. Over 450,000 physicians certified by one of 24 member boards are currently enrolled in a Maintenance of Certification program; every 10 years they must document continued competence in each of these areas, not just medical knowledge and patient care. Finally, competence in all six is essential for the state licensure necessary for practice. A principal benefit of our program is our strategic, intentional approach to promote our students' acquisition of these competencies through curricular activities and co-curricular learning experiences.

Although it is not our aim to achieve the physicians' (or other health professionals') entry-level competency in each of these areas upon completion of the MBS curriculum, we do aim to provide a comprehensive foundation for building competence in each of the eight domains.

Curricular	Pedagogical	Integrated	Medical arts &	EMT training	Individualized	Advising
Component	approach -	human	sciences	and clinicals	elective	
	TBL	biological	proseminars		component	
		sciences				
Domain		courses				
Patient care			v	V	v	
Knowledge for		v		V	v	
practice						
Practice-based	V		V	v		V
learning &						
improvement						
Interpersonal &	V	V	V	V	V	V
communication						

Curricular	Pedagogical	Integrated	Medical arts &	EMT training	Individualized	Advising
Component	approach -	human	sciences	and clinicals	elective	
	TBL	biological	proseminars		component	
		sciences				
Domain		courses				
skills						
Professionalism	V	V	V	v	V	
Systems-based			V	v	V	
practice						
Interprofessional	V		V	v		
collaboration						
Personal &	v		V	v	V	v
professional						
development						

8. Is there coordination with the Office of Health Professions Advising?

Dr. Dan Scheirer, Director of the Office of Health Professions Advising (OHPA), served on the original Advisory Committee convened by Dr. Dona Chikaraishi in 2011 to explore the feasibility of offering such a program; both Dr. Scheirer and Dr. Alyssa Perz-Edwards, Director of the Cardea Scholars Program, serve on the current MBS Advisory Committee. Drs. Lee and Andolsek have maintained communication with Dr. Scheirer regarding the program; a joint meeting of the MBS program leadership and the OHPA staff is planned for later this fall. The MBS financial plan includes partial FTE funding to be directed to OHPA to enable advising support for MBS students. Furthermore, we believe the Office of the MBS and the appointment of an Assistant Dean for Premedical Education (Dr. Andolsek) within the SOM will enhance advising and other opportunities for Duke undergraduates through improved networking with SOM faculty. In addition the MBS and its SOM Office of Premedical Education hope to expand support to students not currently reached by OHPA, specifically graduate students who did not receive undergraduate degrees from Duke who now aspire to health professions careers.

9. How will students manage the financial burden?

We will help students manage the financial burden by establishing our tuition at a reasonable price point to support the faculty and programmatic resources necessary for a high quality program and to achieve financial sustainability, include financial management in the curriculum, and provide scholarship support.

In developing our financial plan, we reviewed tuition charges for programs at peer institutions and among existing Duke master's degree programs. The tuition for the MBS (\$39,500 in Year One) has been carefully established to be mid-range among those.

To date, we have not identified any Special Master's Programs that offer scholarship or financial support beyond that available through traditional financial aid programs. In keeping with existing SOM practice, the MBS will direct a portion of its revenues (15% initially) to scholarship support for selected students, particularly under-represented minorities and first generation college students. The SOM will apply its existing criteria for needs-based

scholarship support. Students in the program will also be eligible for federal financial aid. The Curriculum will include financial planning and debt management.

Once the program is established, the MBS Program will expand scholarship support through a variety of mechanisms including exploring philanthropic and grant support for additional scholarships. Long-term plans call for cultivating industry support for internship placements.

10. What are the admissions criteria? How will MBS know which applicants will benefit from this curriculum?

To be considered for admission, a minimum GPA of 3.2 on all undergraduate and post baccalaureate graded work is required. In addition, applicants who have taken the MCAT must have a minimum score of 27 on the MCAT within the last 3 years. In addition to completion of the online application form, applicants will be required to provide transcripts, personal statements, responses to essay questions, letters of recommendation and to participate in an in- person or video interview with a subset of the Admission Committee, to include the Assistant Dean for Premedical Education.

Our selection criteria aim to guide us to the students who are most likely to succeed. We will conduct rigorous outcome assessment of our graduates and use their input in the continuous educational improvement of the MBS. As we gain greater experience with graduates over the next few cohorts of matriculants, we will carefully analyze the characteristics of successful students to inform any changes warranted in our admissions practices.

11. Who are the faculty who will teach in the program?

The Faculty for the MBS are drawn from existing SOM faculty. Course directors for the core required courses have been identified and have begun course development with financial support from SOM reserve funds. The CVs for these faculty are included in the Appendix 15 of the proposal.