Association of
American Medical Colleges
655 K Street, N.W., Suite 100, Washington, D.C. 20001-2399
T 202 828 0400
www.aamc.org

August 3, 2016

Shiva P. Singh, Ph.D.
National Institute of General Medical Sciences
National Institutes of Health
singhs@nigms.nih.gov

Re: Request for Information: Strategies for Modernizing Biomedical Graduate Education (NOT-GM-16-109)

Dear Dr. Singh,

The Association of American Medical Colleges (AAMC) is pleased to have this opportunity to offer comments related to catalyzing the modernization of graduate education. The AAMC is a not-for-profit association representing all 145 accredited U.S. medical schools, nearly 400 major teaching hospitals and health systems, and more than 80 academic and scientific societies. Through these institutions and organizations, the AAMC represents nearly 160,000 faculty members, 83,000 medical students, 115,000 resident physicians, and thousands of graduate students and postdoctoral trainees in the biomedical sciences. Our comments reflect input from many of these constituents, primarily collected through our Group on Graduate Research, Education, and Training (GREAT), Group on Research Advancement and Development (GRAND), and Council of Faculty and Academic Societies (CFAS)[1]. While the AAMC's comments here focus on general themes, we have encouraged our member institutions to respond as well.

Biomedical graduate education has an enormous value to society, not only through the development of researchers, but also in the training of scientists who can apply analytic methods and critical thinking to a number of different jobs and sectors to support the research enterprise as a whole. The wide array of career paths taken by biomedical science PhDs, including academic administration, law/policy, consulting, writing, and industry/academic/government research, highlights this strength. Graduate programs currently represent a broad range of

[1] The GREAT Group is AAMC's professional development group for graduate school deans, MD-PhD program directors, and postdoctoral program directors who have responsibility for biomedical PhD, MD-PhD, and postdoctoral training occurring within medical schools and teaching hospitals. GRAND is a professional development group for research deans and deans of clinical and translational research at these same institutions. CFAS is AAMC's council comprising faculty representatives appointed by medical schools and academic societies, providing a voice for academic faculty within the AAMC's governance and leadership structures.

opportunities that allow students to find a good research and institutional fit and this breadth should be expanded to encompass the whole of the training experience.

The following is a summary of AAMC's recommendations to NIGMS, described further below:

- Emphasize professional development, wellness, mentor engagement, and individualized training programs.
- Ensure that graduate students are trained in skills such as communication, teaching, management, and teamwork.
- Quantitative and data analysis skills are essential components of graduate training.
- Allow flexibility in the use of training grant funds and educate reviewers to more holistically evaluate applications.

Changes that could enhance graduate education

We suggest several changes to modernize the current system of graduate education, which has not significantly changed in the past several decades. The AAMC encourages the development and definition of training milestones based on skills, competencies, and the individual level of each trainee, rather than the use of a "one size fits all" timeline for graduation. Rethinking the requirements and progression of a PhD might also include an assessment about the current structure of the thesis project and how students can best demonstrate the knowledge gained during the PhD.

Many PhD programs mandate a large number of didactic lecture courses in the first year. The use of adult learning principles to make these courses more learner-centric could create a more useful background for the student's research and provide a more engaging experience. Additionally, trainees should have the opportunity to work with peers and more advanced colleagues to develop an understanding of the benefits of team science. Graduate programs can promote this type of learning by encouraging interdisciplinary training and collaboration, both within the institution and in regional and national networks.

Outside of the classroom, there are a number of cultural shifts that the AAMC believes are critical to trainee development. Student wellness is an important element for success during PhD training. The NIH intramural program is a good model in this area, by incorporating discussions of student wellness into trainee workshops. Extramural training programs should utilize existing institutional resources to address stress, resilience, and mental health. AAMC also supports efforts to enhance mentorship, including through a "train-the-trainers" framework, or an increased focus at the institutional level of defining and recognizing the characteristics of a good mentor. We applaud the National Research Mentoring Network and its emphasis on diversity and inclusivity, and additionally recommend that mentors are trained in recognizing unconscious bias as we work toward achieving equity in the research enterprise.

Finally, professional development is a critical element that is often lost in the current biomedical science training process. There is an ongoing need for NIH to communicate the dual-role of students and postdoctoral researchers to grantees, to ensure that trainees are prepared to enter the workforce after completion of their time in the lab. Several institutions have mentioned that having trainees be fully supported on a research grant inhibits ensuring time is allotted for career development activities. It was suggested that a percentage of trainee time (5 to 10%) be

supported from other resources, or that specific funds be designated in a research grant for training**.** An additional challenge in this area is a lack of accurate and complete data or long-term longitudinal tracking of career outcomes. The AAMC has long supported tracking and reporting of career outcomes, including for doctoral graduates, postdoctoral researchers, and physician scientists, which would provide applicants and students with resources to make informed decisions about career options. Any measures of success for training programs should be revised to include diverse career outcomes and pertain to any careers that utilize scientific competencies.

Key skills for biomedical graduate students

The AAMC would like to call attention to skills in several key areas which our constituents have identified as essential components of biomedical graduate education. It is critical to codify the training of graduate students in professional skills such as: communication (oral and written), teaching, management, and teamwork. All of these are routinely taught in professional schools such as medicine, business, and law. Graduate programs should broadly implement this type of skill development, and also dispel the notion that professional skills are only for those that want to pursue a career outside of academic research. We note the success of the NIGMS Institution Research and Academic Career Development Awards (IRACDA) in facilitating a diverse group of postdoctoral scholars to develop academic and teaching skills, and encourage the allocation of additional resources to help institutions develop and implement similar programs.

One of the primary challenges of the current apprenticeship model of graduate education is the lack of explicit focus on leadership development during the PhD, followed by the expectation that graduates to have the capacity to go out and lead after their training. Along with leadership skills, trainees would benefit from learning principles of entrepreneurship, networking, and interviewing, as well as professional behavior—parallel to that already taught to medical students. It is also important to embrace the concept of resiliency, particularly as it applies to understanding failure in research and pursuing a career after graduation. The AAMC encourages graduate programs to not only create environments for trainees to develop in-depth discipline-based expertise, but also teach skills needed to effectively conduct or lead research in teams, and understand the full spectrum of research.

Quantitative skills and a comprehensive knowledge of statistics, experimental design, and data analysis were frequently cited by institutions as necessary for training and to maintain rigor and reproducibility in research. These concepts are most effective when taught in a program-specific manner that is tailored to the individual research area of the student. It is also important to supplement these hard skills with an acknowledgement and understanding of responsible conduct, situational ethics, and judgement. Along the same lines, there is an increasing need for computation and facility with big data, creating a strong argument for additional training in writing code as a core competency for graduate researchers. Especially in this area, trainees should be given the option or opportunity to tap into regional and national programs to get exposure to areas not robust at their home institution.

The AAMC cautions against establishing new requirements and making all of these skills mandatory for trainees. Some trainees may come into a program already well-versed in these areas. Also, programs should have flexibility in deciding how to implement skills development and balancing this need with the length of graduate training.

Training grant program approaches
A number of institutions have commented on the importance of flexibility in the use of funds under the training grant mechanism. They appreciate the ability to receive administrative funds to support activities like tracking career outcomes or preparing data for program review, and request that such support is expanded under grants.

The AAMC also encourages NIGMS to allow for flexibility in the use of funds to develop innovations in training**.** For example, using resources to support externships, professional development courses, and a broader selection of curricular offerings for trainees. Training grant funds should additionally be available to support students in taking extra courses outside of the sciences, such as in the law school, business school, or education department, or for travel to a non-scientific conference, to give a student the greatest opportunity to broaden their education. Allowing for as much flexibility and individualization as possible facilitates trainees expanding their strengths and interests. Another use of training funds might be to allow institutions to pilot courses in areas such as bioethics or quantitative skills development, in order to evaluate the optimal methods of teaching these competencies.

The AAMC supports holistic review of training programs as related to their impact on trainees, institutions, and society, and educating reviewers to define success more broadly than pursuing an academic research career. During evaluation of grant applications**, t**raining programs should not be criticized for participation or utilization in institutional training efforts. Rather, programs should be encouraged to partner with existing opportunities on their own campuses. Reviewers should also allow for some variance in time to degree in review of T32s (as noted above, training should be based on competencies, not based on time). AAMC also urges NIGMS incorporate the expectation that institutions have a built-in evaluation and dissemination plan within the T32 application, to ensure that best practices and outcomes are widely and rigorously shared with the community.

The AAMC appreciates the opportunity to comment on strategies to modernize graduate education, and we look forward to working with the NIGMS on this issue. Please feel free to contact me or my colleagues, Jodi Yellin, Director, Science Policy (jyellin@aamc.org) and Anurupa Dev, Senior Science Policy Analyst (adev@aamc.org) with any questions about these comments.

Sincerely,

Alex Ommaya, DSc
Acting Chief Scientific Officer