

ACTION PLAN FOR REVITALIZING THE NATION'S PHYSICIAN-SCIENTIST WORKFORCE: FOUR MAJOR RECOMMENDATIONS

OF THE 30
RECOMMENDATIONS
PROPOSED BY THE
BREAKOUT GROUPS AND
THEN DISCUSSED BY ALL
CONFERENCE
PARTICIPANTS
(SEE APPENDIX E),
THE FOLLOWING
FOUR MAJOR
RECOMMENDATIONS
WERE MOST HIGHLY
PRIORITIZED BY POLLING
ALL CONFERENCE
PARTICIPANTS.

1 ATTENTION AND RESOURCES SHOULD BE DIRECTED AT REPAIRING THE "LEAKING" PHYSICIAN-SCIENTIST PIPELINE. *Traditionally, physician-scientists have been developed en masse, with institutions launching numerous careers in the hopes of retaining a relatively low yield of successful, independent investigators.*

- Institutions should consolidate their focus on accommodating, retaining, and then fully supporting the most promising physician-scientist faculty members with sufficient and more stable resources, competitive salaries, mentoring, and protected time for research.
- The National Institutes of Health (NIH) should optimize its mechanisms of support for the career development (K) award, including increased salary support, flexibility in award length to accommodate time out for family responsibilities, and financial support for mentors commensurate with effort. With thoughtful guidance and peer review, NIH should implement a mechanism to prematurely terminate clearly non-productive K awards. This should be done without discouraging high-risk, innovative research by committed trainees.
- NIH should substantially increase support for first time R awards, since a major vulnerable point in the pipeline occurs in the transition to independence.
- NIH should direct funds to study and monitor its investigator workforce, particularly tracking applicants over time, analyzing the effectiveness of its grant mechanisms, and studying the impact of policy changes on career decisions. Academic societies should track data on trends in physician-scientists who join the biotechnology and pharmaceutical industries.

2 MAJOR CHANGES SHOULD BE MADE TO THE CONTEMPORARY APPROACH TO MENTORING PHYSICIAN-SCIENTISTS. *The success of physician-scientists today requires institutionally mandated, career-long, multi-dimensional guidance and support by teams of skilled mentors who contribute dedicated effort to this activity.*

- Institutions should create and implement formalized mentoring programs for physician-scientists that incorporate several contemporary facets.
 - Mentees may require team-based mentoring by groups of mentors who have complementary skills and insights into various aspects of a physician-scientist career.
 - Institutions should organize multi-generational mentoring groups to acknowledge and reconcile the striking generational differences in attitudes toward work-life balance and controllable lifestyles.
 - Institutions should ensure that mentors reflect the diversity of the workforce and that mentors are trained in approaches to mentoring junior faculty of different genders, races, and ethnicities.
- Mentoring programs should include formalized training in career negotiation and tracks, grant writing and management, and presentations and publications as well as scientific guidance.
- Institutions should provide formalized training in mentoring skills for mentors and establish evaluation systems to ensure effective mentoring.
- Mentors should receive financial support commensurate with professional effort from the institution and/or granting agency.
- NIH should expand mentoring awards in scope and amount for senior physician-scientists through the K series to support and enhance dedicated mentoring of junior physician-scientists, enabling better utilization of the time and effort of many senior researchers, and potentially freeing up additional R01-type awards for junior and mid-career investigators.

3 INSTITUTIONS SHOULD PROACTIVELY PROMOTE THE ADVANCEMENT AND MINIMIZE THE ATTRITION OF WOMEN IN PHYSICIAN-SCIENTIST CAREERS. *The demographics of medical school graduates are rapidly transforming, with female graduates anticipated to comprise the majority in the coming years. Academic medicine must take advantage of this opportunity to expand the physician-scientist workforce to include female faculty. Yet, women physicians generally find research careers less appealing and accommodating than men.*

- Institutions should ensure that men and women of equal academic standing receive equivalent protected time, start-up packages, bridge funding, space, and access to other resources.
- Institutions should substantively increase the flexibility of time-based review in the promotion process and in the tenure clock for investigators who need additional time to move to successful independent funding.
- Institutions should aggressively support the provision of easily accessible on-site child care, the development of lab schools, and other initiatives that equalize opportunities for women to succeed as physician-scientists, remain productive in physician-scientist careers, and attain leadership positions in academic medicine.

4 THE PHYSICIAN-SCIENTIST WORKFORCE SHOULD BE STRENGTHENED BY EARLIER AND MORE COORDINATED EFFORTS TO IDENTIFY AND PREPARE SUCCESSFUL FUTURE INVESTIGATORS WITH A MORE ENDURING COMMITMENT TO RESEARCH CAREERS.

- Universities should broaden the focus of undergraduate premedical education curricula to place more emphasis on the physical sciences and quantitative skills, molecular biology and genetics, biostatistics, and ethics. In turn, the Association of American Medical Colleges should alter the Medical College Admission Test to reflect the curriculum changes.
- Medical schools should partner with the pre-medical advisor community to promote the physician-scientist pathway to undergraduate students.
- Research-intensive medical schools should alter their admissions committee culture to accommodate more applicants with strong research interests, including special sub-committees that make decisions related to research-interested students.
- Research-intensive medical schools should place interest and resources in medical student research by providing a full-year of research and stipends for approved full-time student researchers.

APPENDIX E

**THIRTY RECOMMENDATIONS EMANATING
FROM THE CONFERENCE BREAKOUT GROUPS**

MENTORING

THE FOUR MAJOR
RECOMMENDATIONS
OUTLINED ON
PAGES 8 AND 9
WERE PRIORITIZED
FROM THE
FOLLOWING
LIST OF 30

- 1 Institutions should create and implement formalized mentoring programs for junior physician-scientists. The programs should include:
 - a. Team-based mentoring. Mentees should have groups of mentors who have skills and insight into various aspects of a physician-scientist career.
 - b. Multi-generational mentoring groups.
 - c. Assistance and education on career negotiation and tracks, grant management and writing, presentations and publications, and scientific skills.
 - d. Support for the mentor. Mentors should receive financial support from the institution and/or granting agency.
 - e. Formalized training for mentors on how best to serve as a mentor.
 - f. Evaluation procedures to ensure mentors are providing proper support.
- 2 Institutions should implement mentoring programs for mid-career and tenured physician-scientists. These programs should require a yearly review of mid-level and tenured faculty. The reviews will include formal presentations to groups of senior faculty to ensure productivity and provide input on preliminary research for subsequent grant applications.
- 3 NIH should create a mentoring award for senior physician-scientists through the K series to support and enhance mentoring of junior physician-scientists. The award will better utilize the senior researcher's time and effort and will open up additional ROI awards for junior and mid-career investigators.

K AWARDS

- 4 NIH should increase its support of the K award mechanism. In particular, the agency should:
 - a. Increase salary support to \$100,000.
 - b. Open eligibility to include part-time researchers.
 - c. Increase the length of the award.
 - d. Provide monetary support (with corresponding committed effort) for mentors on K award grants.
 - e. Require mentor training for primary mentors on K awards.
 - f. Include mentor evaluation as part of the grant review process.
 - g. Require institutional program and track record as part of the K award application process.
 - h. Allow K award recipients to apply for their ROIs earlier.
 - i. Create a mechanism to end non-productive K awards.
- 5 NIH should alter the eligibility requirements for the Pathways to Independence Award so K award recipients with three years or less of prior K support are eligible to apply.
- 6 NIH should fund grants dedicated to studying its investigator workforce, particularly tracking applicants over time, analyzing the effectiveness of its grant mechanisms, and studying the impact of policy decisions in terms of funding and career decisions.

- 7 K award recipients should be required to submit an R01-equivalent application in the second or third year of their K award. Failure to do so would lead to termination of a presumably non-productive K award.

R01 AWARDS

- 8 NIH should increase the length of first-time R01 awards to seven years. NIH should require an extensive review in the fourth year to ensure productivity, using the merit award review as a model.
- 9 NIH should require all first-time R01 recipients to serve as ad hoc study section reviewers in the third year of the grant.
- 10 NIH should offer a joint R01 which is co-submitted by a junior and senior investigator. During the second year of the award, the junior investigator will be responsible for the outcomes of the award.

- 11 NIH should develop a mechanism to supplement an R01. The supplement would provide funds to support salary and supplies for a mentee of the investigator (no age requirements, perhaps weight women, underrepresented minorities). To receive this funding, the institution should commit/protect time for the R01 awardee to mentor this person, so there is an incentive to mentor. In order to be eligible for this funding, R01 recipients should have received formal mentor training.

- 12 Institutions should create formalized bridge funding mechanisms for productive faculty. Institutions should partner with the pharmaceutical industry to create a mechanism for industry support in exchange for right of first refusal for any discoveries made from the research.

ADMISSIONS AND CURRICULUM

- 13 Universities should broaden the focus of undergraduate premedical education curricula to place more emphasis on the physical sciences and quantitative skills. In turn, the Association of American Medical Colleges should alter the Medical College Admission Test to reflect the curricula change.
- 14 Research intensive schools should be obligated to place interest and resources in medical student research via a fifth year of research. These institutions should alter their admissions committee culture to accommodate more applicants with strong research interests and provide stipends for approved full-time student researchers.
- 15 Medical school admissions committees should create special subcommittees that make decisions related to research-interested students.

- 16 Medical schools should partner with the pre-medical advisor community to promote the physician-scientist pathway to undergraduate students.
- 17 Combined degree (MD-PhD) programs should increase the pool of qualified candidates for MD-PhD programs by increasing outreach to undergraduates, medical school applicants, and first and second year medical students. More research passion (not just experience) should be a requirement for medical school. MD-PhD programs should increase the program size to accommodate the pool. The Federation of State Medical Boards and the National Board of Medical Examiners should maintain the USMLE step one.
- 18 Provide loan repayment for first year of medical school for transfer students into the MD-PhD program.
- 19 Institutions should create a grant mechanism similar to the Howard Hughes Medical Institute "Med into Grad" Program, which encourages individual institutions to develop programs to bridge the gap in the pipeline (created by clinical training requirements) from MD-PhD graduate to academic faculty member.

INSTITUTIONAL INITIATIVES

- 20 Institutions should integrate university, medical school, and graduate medical education with progression based on competencies (allow faster progression than presently the case to allow for research efforts).
- 21 Departments should set compensation for physician-scientists based on the amount of money that individual could make as a full-time clinician. Funding can come from a variety of sources (dean, hospital, practice plan). Institutions should consider the return of indirects as a means for concentrating resources on excellence.
- 22 Institutions should remove time-based review from the promotion process and halt the tenure clock indefinitely for investigators who need additional time to successfully move to independent funding.
- 23 Institutions should promote team-based research that includes interdisciplinary themes across the biomedical engineering and physical sciences (that also includes other non-medical disciplines) and develop the infrastructure at an institutional level to support clinical and translational research.
- 24 Institutions should allow investigators to work in academically-recognized, high-quality scientific teams for protracted periods of time. An individual's time commitment to the team could fluctuate according to work-life balance needs, but the team's efforts as a whole will remain constant.

- 25 Institutions should implement functional infrastructure platforms across silos to facilitate and catalyze clinical and basic research. Institutions need a toolbox of activities, such as proteomics, genomics, and core personnel (research nurses, hospitalists to cover the General Clinical Research Center equivalent) to facilitate and integrate research careers across specialties. The toolbox requires strategic and financial planning within academic medical centers and interaction across academic medical centers, e.g. phenotyping.
- 26 Medical schools should alter the Hippocratic Oath to include an obligation to the discovery and dissemination of new knowledge as a condition of entry into the medical profession.
- 27 Institutions should ensure that men and women of equal academic standing receive equivalent lab space, protected time, and start-up packages and future access to resources.
- 28 Institutions should reassess their approach to supporting physician-scientists early in the pipeline. Rather than encouraging large numbers of junior physician-scientists to enter the pathway, institutions should set a limit on the number of physician-scientist faculty they will accommodate and then fully support these faculty members with sufficient resources, salaries, and protected time. This recommendation is aimed at repairing the pipeline rather than necessarily expanding it.
- 29 Institutions should commit to making diversity a core institutional value and objective. Institutions should encourage the Liaison Committee on Medical Education to implement regulations that create a set of metrics and expectations that require institutions to address gender differentials and discrepancies in underrepresented minority representation in academic medicine.
- 30 Lobby the health provider and insurance industries to create research and development components in their companies and agencies to support research.