Gaining, training and retaining physician scientists should be a national priority

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The recent buildup in our nation's investment in biomedical research has created an expectation of better health for all Americans. We have created an unprecedented wealth of information and have stimulated the public's interest in the potential bounty of their investment in the life sciences. While much remains to be learned about the fundamentals of basic biology, we need to make certain that we rigorously exploit, through translational research, the knowledge that we have already obtained. Clearly the best translators from bench to bedside are those that speak the native language: the physician scientists. Yet in this time of abundant opportunity, when Congress and the American public's demand for translational research has never been higher, when the scientific opportunities have never been greater, why are we not seeing an increase in the number of physician scientists among National Institutes of Health (NIH) grantees?

Much has been written on the plight of the physician scientist, and it seems likely that as budgets get tighter and success rates fall we will lose even more of them to private practice or other healthcare delivery venues. The barriers to the physician scientist pathway have been well articulated: a significant debt burden; lack of training opportunities for "late bloomers" who wish to pursue a research career after residency; a dearth of funding opportunities; clinical research not faring as well in peer review; and the availability of other career opportunities that make it easy to leave the research pipeline. How do we, as a scientific community, address the challenge of translating the wealth of new and highly relevant scientific information to the diagnosis, treatment and prevention of human disease? Most MD researchers would find themselves nodding their heads in agreement to this litany of issues, and all agree that we need more physician scientists to accelerate translational research. I fear that clinical research will be the first to feel the pinch of tightening federal research budgets. The risk is that the physician scientists, who have been encouraged to pursue research careers in recent years, will be unable to secure funding from NIH and will be lost from the small pool of trained clinical researchers. There are key questions that must be addressed. Are our presuppositions regarding the obstacles for physician scientists true, and are the patchwork solutions we've developed working? Or are there fundamental cultural issues regarding the role the physician scientist plays in the research enterprise that need to be overcome?

We can examine our assumptions about the physician scientist by focusing on three distinct parts of the problem: gaining, training, and retaining. Too little attention has been directed toward gaining

new physician scientists at an early point in their education. Fewer and fewer incoming medical students express an interest in research careers, and few seem to gravitate toward that path during the course of their medical studies. For those with an early interest in research, pursuit of a PhD may appear to be the only route, and it is certainly the most direct. Programs aimed at the undergraduate or medical school level present an area of opportunity for gaining new physician scientists, as do clinical research-oriented master's programs, some of which are funded by NIH. There has been a recent increase in the number of positions for MD/PhD programs and "year out" programs for medical students to get exposure to basic science research. The Doris Duke Foundation, for example, supports medical students who take a year off during their training to do clinical research, and clinical research has been designated as one of three areas of concentration that will run throughout the entire four-year program in the revised Harvard Medical School curriculum. The hope is that such programs will ignite the fire of intellectual curiosity and inspire long-term pursuit of research careers for young doctors-in-training. In these programs, research experience is obtained before the clinical training begins in earnest. However, in addition to the specialized programs, the years of patient experience involved in residency and fellowship are fundamental for the translational scientist. This raises the important question of timing: are those who receive research training early in their medical school experience more likely to maintain their interest and pursue research careers rather than those physician scientists who receive research training following specialization?

Training graduate MDs in clinical research presents its own challenges. The Clinical Research Enhancement Act supported the creation of programs to support training and retention of translational research and patient-oriented, research-oriented physician scientists. NIH's K awards, which provide basic and clinical research training for specialized and sub-specialized MDs, seem like an important step forward. A newly published report by the National Research Council (NRC) recommends training programs at the master's level to train physicians in clinical research, while allowing them to keep their day jobs; NIH offers the K30 award to develop such curricula. It still remains unclear whether these programs afford the requisite skills and invoke sufficient confidence to induce a trainee to embark on a career in translational research. Unfortunately, nearly 40% of K08 recipients fail to apply for R01 awards according to a recent study, while the clinical research oriented K23 programs are still too new for their ability to support retention in successful research programs to be assessed. Indebtedness following medical school has often been cited as one factor in discouraging MDs to go into or remain in clinical research; however, loan repayment programs as incentives for clinical research have been available for some years now.

With the relatively recent focus on training clinical researchers, it may make the most sense to consider the importance of retaining those physician scientists who have made the choice to pursue a research career, given the competitive alternatives that draw them out of the research pipeline. Non-research job opportunities are

available, stable, pay well, and allow one to have an immediate and tangible impact on human health. Attrition rates among NIH-funded clinical investigators have been well documented. Better funding opportunities for physician scientists are one possible solution. Some have charged that constraints on the time of clinical researchers have decreased their ability to participate in peer review, thereby contributing to a climate unfavorable to clinical grant applications. While MDs do well overall in the grant review process, patient-oriented clinical research has fared less well, suggesting that special study sections or other incentives that support patient-oriented research need to be adopted. Unfortunately, we must also acknowledge the basic organizational bias that has crept into many academic medical center clinical departments and university administrations. Essentially, the economic and social forces at academic medical centers have not been directed toward integrating research into educational and clinical affairs, but rather in separating them. Perhaps a better understanding of the challenges faced by physician scientists will lead us to rethinking entirely the academic medical enterprise.

How then to retain the physician scientist? To answer this question, we need to better understand the factors which determine whether an MD enters or stays in the research pipeline. The oft-cited considerations of indebtedness, lack of training opportunities, study section bias, and lack of funding stability may not adequately explain the problem. We need to look more closely at the K awards, and assess why those who receive them do not subsequently pursue independent R01 research grants. How can we improve the chances that the investigator trained on a K award will subsequently make the successful transition to independent funding and an independent research career? Reapplication rates for NIH grants are very low among MDs: why is this? What effect will the recent proposal for recognizing the status of multiple PIs have on the physician scientist's ability to maintain a leadership role in research? Finally, how many physician scientists are engaged in research that is funded outside of NIH, through foundations or industry sponsored programs (either industry or investigator-initiated) and how can this be quantified? It is critical that the NIH prospectively collect data on the effectiveness of training and incentive programs in retaining physician scientists in clinical research, whether their ultimate source of funding is NIH R01 grants, foundation grants or industry.

Passionately defending NIH funding on the floor of the Senate on March 11, 2004, Senator Arlen Specter (R-Pa.) presented a list of ten projects he thought would sway his colleagues to support higher appropriations: nine out of ten were clinical or translational projects. We have entered what Senator Edward Kennedy (D-Mass.) has called the "new century of the life sciences." Physician scientists must play a critical role in bringing the fruits of NIH's doubling to the bedside. Subspecialty trained MDs are the ones that will have access to the patient populations that will be required for testing new medical advances that come from understanding the basic mechanisms of disease. They have the necessary perspective to gauge the benefits and the risks of potential new treatments, and can assess what this equation means for a given patient. In addition, specialty-trained MDs

are in a position to know the variability in presentation of a disease, both in terms of the history of the disease and the between-patient responses to a specific disease, therefore playing a critical role in the design of trails. NIH is the leading and sometimes only source of funds for certain types of clinical and translational research that are not carried out in the private sector, including studies designed to examine the mechanisms of human disease (and the genetic basis of disease), studies of combination drug therapies, drug comparison trials, cost-benefit analyses of therapies, or adapting therapies for specific “small market” populations, such as children or rare diseases. Such studies are critically important in the translation of basic biomedical insights to human health and cannot be done effectively without trained and committed physician scientists. We have begun to develop programs to attract and train clinical researchers, but it is only when the true value of clinical research is appreciated by academic health centers, the NIH, and the public that we will be able to maximize the potential of these talented individuals and reap the benefits of these early initiatives.

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