In a World of Global Positioning System, Why a Roadmap? and Is Translational Research a 2-Way Street?

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I do not know who made up this title. I took some time to figure out what the title meant, but once I did that, I realized we were on the right pathway. I appreciate the chance to share more about National Institutes of Health (NIH).

Because we are using the metaphor of roadmaps, I thought I would create a roadmap of my talk. I have divided my presentation—an environmental scan—into 3 parts: to restate but acknowledge information, to translate translational research and ask "Why a roadmap in a world of global positioning system (GPS)?" and finally, to address whether translational science is a 2-way street and, in that regard, comment about crossing the so-called valley of death.

ACKNOWLEDGING THE CURRENT ISSUES IN HEALTH CARE

For the environmental scan, we all appreciate that the public health challenges that we face today differ from those 25 or even 30 years ago. Health issues have shifted from acute to chronic conditions for a wide range of reasons. The population continues to grow. We also need to deal with profound health disparities across the United States, such as the issues of emerging and re-emerging infectious diseases and emerging noncommunicable diseases, such as obesity.

When we take these issues and superimpose the changing demographics of our workforce, we begin to understand the magnitude of issues that we are facing. We also have to identify how much has changed (Fig. 1). If we plot the age on the *x* axis of a grid, we draw a red line for medical school faculty and blue bars to represent principal investigators of NIH awards. This visual illustrates circumstances in 1980 (Fig. 1). I added a lavender X, which represents me (29 years old) when I received my first grant. A remarkable thing has happened in the ensuing years, above and beyond the fact that I have become older. If we look in 2006, we see a dramatic shift to the right, both in the demographics of medical school faculty and the demographics of those who we support with NIH research grants. We now fund more individuals who are 65 years and older than we do who are 35 years and younger. I am not saying that this is a negative or positive development. I am making an observation and one that we need to reconcile.

Finally, in trends, for more than 30 years, individuals with MDs or MD/PhDs have been only approximately one third of the principal-investigator pool in NIH R01 grants versus PhDs who receive funding. For that period, the number of mentored career-development awards has increased almost 4-fold, yet we continue to have the following concerns: physicians have lower success rates than MD/PhDs or PhDs; MDs who propose clinical research are funded at lower rates than those who propose nonclinical projects; and finally, MDs are less likely to have R01 research grants. I should add that my brethren-dentists perform as MDs do, except that we have fewer DDSs than MDs.

Regarding economic considerations, in 2008, the NIH budget was $29.5 billion, 84% of which is spent outside of Bethesda, Md. The budget supports more than 300,000 extramural research personnel at more than 3000 institutions around the United States. In 2008, clinical research comprised approximately one third of our NIH effort, which has held relatively stable in recent years. In 2009, the American Recovery and Reinvestment Act passed, and the NIH is grateful to Congress and the president for attempting to improve both the nation's health and its economy by giving funds to the NIH.

People usually ask me, "What will the NIH do with all of that money?" We are, of course, using these funds to stimulate and accelerate biomedical research. Much of that research will be done with existing mechanisms: that is, we fund additional meritorious R grants, although we did not have sufficient appropriated funds to award but these R grants have already been peer reviewed and approved by institution and center councils. We are using some administrative supplements to accelerate ongoing research. We are also expanding science with new programs, which include revisions to extent programs, which we used to call competitive supplements. We have several new area-specific programs, some of which are NIH-wide and some are specific to institutes and centers. We hope to immediately impact and stimulate the economy by preserving and creating jobs. Because we see a ripple effect, we hope that the findings advance biomedical research for years to come.

TRANSLATING TRANSLATIONAL RESEARCH

Translational research comes in 2 categories. First, some studies are designed to identify and build the scientific links to move results from the bench to the bedside and to effectively implement evidence-based intervention in the world. Second, some research is the application of research findings or evidence-based interventions for public health medical-practice policy or decision making.

Therefore, in the world of GPS, why a roadmap? As many investigators know, the NIH roadmap for discovery had 3 major programs, one of which is reengineering the clinical research enterprises. My colleague, Dr Hayward, has already discussed the Clinical and Translational Science Awards (CTSAs) and the many things that the CTSAs are doing to help speed clinical research. Other institutions have presented detailed sets of analyses related to priority issues, such as adverse-event reporting and efforts to

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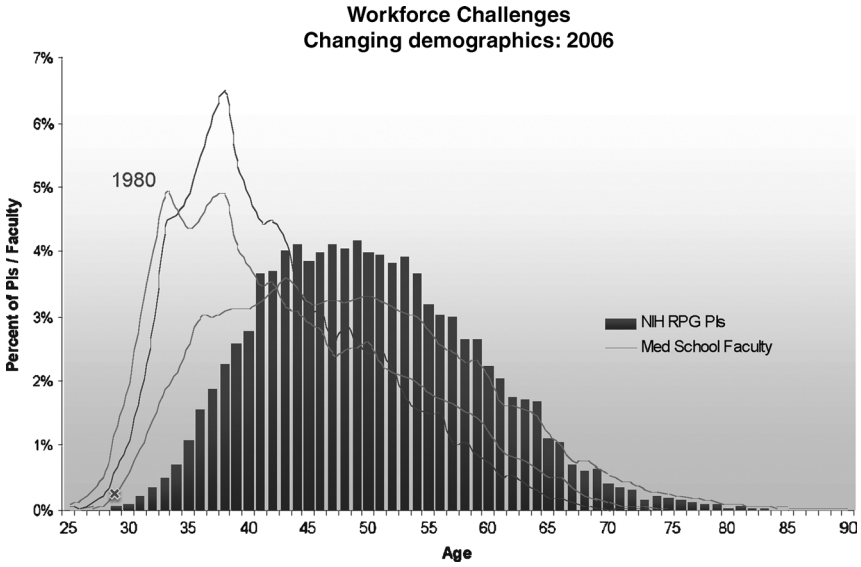

FIGURE 1. Age distribution of medial school faculty and funded researchers.

get basal adverse-event report across agencies—issues related to clinical trials. The NIH has considered each of these issues, as have most of our partner agencies.

The NIH offers a suite of mentored awards for individuals who are interested in clinical research. In particular, the NIH offers the mentor patient-oriented research-development award, the so-called K-23. This morning, I spoke briefly to a group of K awardees from all over the United States. They were attending another conference; I appreciated seeing a room full of young people interested in clinical research. These young people frequently cannot afford the luxury of an academic clinical research–based career because of their education debt and long repayment. National Institutes of Health programs can help them pursue research with funding. Finally, ClinicalTrials.gov has become an important tool, for not only investigators but also patients and their advocates. Because we created this Web site, the database documents more than 71,000 trials and locations in more than 165 countries.

We know the standard model: laboratory research begets translational research, which leads to a clinical question, which ultimately is expanded to the population. Then, a miracle happens, and the information is disseminated and adopted, and public health is improved (Fig. 2). This model is the way clinical research should be; research should be a continuum (Fig. 3). I tell basic scientists that a clinical trial that results in interesting findings will uncover more basic research questions. In particular, if we view research as a continuum, understanding that we still need these important steps of dissemination and adoption to ensure that we improve health, this process is the way research should work.

We as clinical researchers need to take that line and make a continuous circle. Part of our success relates to closing the gap of this so-called valley of death. We may know how to conduct basic research and do well. Most would argue that we know how to do clinical research well, but clinical research is that in-between piece with which we still all struggle. In addition to the CTSAs, the NIH and other organizations offer other programs, such as the National Cancer Institute's Rapid Access to Intervention Development program, which addresses certain needs for small molecules that otherwise would not be scaled up to good-manufacturing-practice grade. Similarly, the NIH's Office of Science Technology has a virtual space where potential partners and investors can review

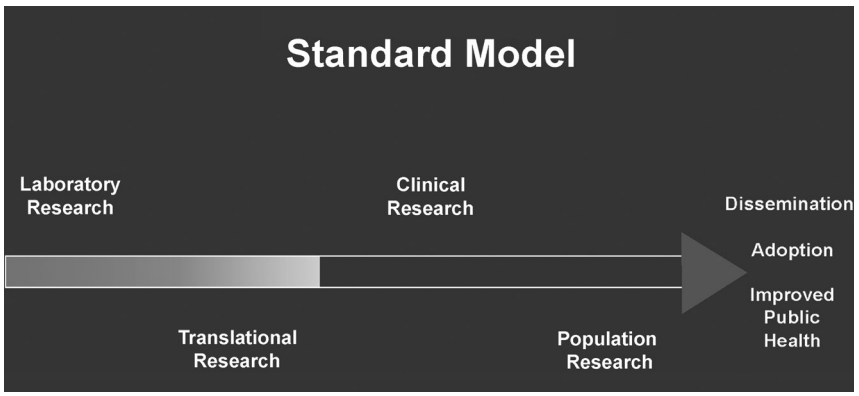

FIGURE 2. Linear model of progress from bench research to implementation of improvements in health care.

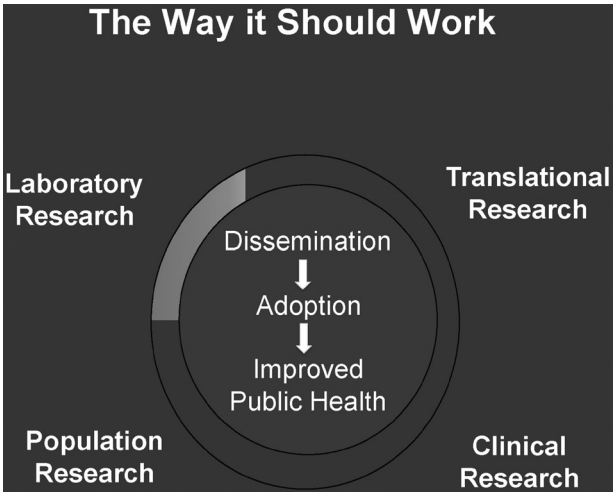

FIGURE 3. The continuum of research discovery and translation.

NIH licenses and NIH small business awards. All of these things help close that extraordinary gap.

CONCLUSIONS

In a world of GPS, why a roadmap and is translational research a 2-way street? The good news is that translational research efforts are being enhanced. New interdisciplinary training, which is so essential for good translational research, is growing and creating a common lexicon that is so necessary for translational research to be effective. Training programs, such as the CTSA, are strengthening the integration of basic and clinical research efforts. At the NIH, for example, we now have targeted resources that we are directing to jump this valley of death. The NIH and other institutions are developing novel models to enhance partnerships between academic health centers and communities. The connection of academic health centers to industry needs to be enhanced in ways that will not only leverage the unique strengths of each party but also ensure the patients' safety. Finally, all stakeholders must ensure sustained support for translational and clinical research.