Training the Clinician Investigator

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Medicine today presents daunting challenges to the young clinician aspiring to an investigative career. Among these are the ever-increasing vastness of the scientific literature, a highly competitive grant environment, and the allure of private practice. Despite these challenges, never have the investigative opportunities been greater. The “gap” between the basic laboratory and the wards is rapidly narrowing, rendering accessible a number of big clinical questions (eg, who really needs an implantable defibrillator? How can we repair injured organs?) that seemed elusive only 5 or 10 years ago.

Here, we reflect on the general question of how to train the clinician investigator. Both of us have spoken on this topic, notably at the Scientific Sessions of the American Heart Association; the present document distills the essence of our reflections and recommendations. Although primarily intended as a primer for trainees and junior faculty facing crucial career decisions, the reflections have important policy implications for addressing a problem that threatens to undermine the future of academic medicine.

Should I or Shouldn’t I?

In facing the prospect of whether or not to go down the clinician investigator path, the trainee must consider a number of issues and possible roadblocks.

Motivation

Are you truly curious and passionate about finding the answer to a significant question? Research should be the end in itself and not the means to an end, such as promotion or recognition (although both of these will ultimately come to the successful clinical investigator).

Length of Training

Specialty boards have generally reacted to the expansion of medical knowledge by steadily increasing the minimal requirements for certification. For example, 12 years or more after college are now required to become a board-certified clinical electrophysiologist (4 years of medical school, 3 years of medicine residency, 3 years of cardiology fellowship, 2 years of clinical EP fellowship). The requirement for recertification perpetuates the burden even after training is complete. Superimposed on these basal requirements is the specific training required to launch an investigative career.

Insufficient Time Dedicated to Research

Most medical school and residency curricula leave little or no time for a dedicated research experience. The first experience is often during fellowships, which typically include a mandatory year for research. Although a year is an important first step, more often than not, this suffices only as an introduction to the basics of any given scientific discipline. A corollary is that excess clinical duties and/or moonlighting during a fellowship can prevent the acquisition of the substantial skills required of an investigator.

Differential Allure of Clinic Versus Science

On the wards, one has to know at least a little about almost everything to function effectively. The goal in investigation is, instead, to know everything there is to know about a focused problem. Not only are the demands different but so are the means of gratification. Caring effectively for an ill patient brings immediate gratification; investigation offers long-term rewards and lasting impact, but on a long-term time scale.

Despite these obstacles, there are compelling reasons to pursue a clinician investigator track:

- **Unique Opportunities.** Technological advances in genomics and other fields have made the study of human subjects more powerful than ever. The ability to rewrite the standard of care is a heady prospect that, for successful clinician investigators, can be the culmination of their calling to the healing arts.
- **The Thrill of Discovery.** Nothing can quite equal the joy of finding something entirely new, and then applying that discovery to effect changes in medical practice.
- **Favorable Skill Sets.** Clinical medicine teaches inquisitiveness, rigor, and persistence, all qualities of exceptional importance to the investigative process. Medical training also leads to a keen, first-hand awareness of unanswered questions of clinical importance. These factors give the active clinician an edge over scientists who are not actively engaged in patient care.
- **Synergy.** The practice of medicine energizes the clinician scientist: we can apply what we know and be challenged by what we do not know.

Pathways to Success

Two primary mechanisms exist, the joint MD, PhD program and the pursuit of postgraduate research after an MD. Both are viable but have their unique advantages and disadvantages.
MD, PhD

- This program is specifically designed to train clinician scientists and has been highly effective in populating both basic science and clinical departments.
- There are no data to suggest that joint MD, PhD training is necessarily more effective than MD only.
- One advantage is the provision of rigorous training early during the formative stages of a career.
- This advantage may be offset by the risk of “fossilization.” Retraining in research is generally required after residency because of the rapid pace of technological progress.

MD With Postgraduate Research

- At least two years should be dedicated to postgraduate research if one is serious about considering the pathway.
- Advantages include the potential for the research to be continuous with appointment to a junior faculty position.
- Irrespective of which pathway you choose, your first faculty position should provide at least two thirds of your total professional effort for research; much less is likely to stunt your growth as a fledgling clinical investigator.

Guiding Principles

The following are offered as important considerations in the process of becoming a clinician investigator.

- Choose the right environment. Training in a noninsular, collaborative environment is often key to success.
- Seek a program that provides a dynamic balance between an emphasis on supervision at the beginning of research training and increasing independence toward the end.
- Select the right mentor, someone who is willing and able to devote the time necessary to fulfill this important role. An investigator with a “big name” is not necessarily a good mentor.

Choose the Right Project

- Ask a bold question.
- Focus the scope of that question such that it is answerable.
- Work on a problem about which you can feel passionate.

Embrace the Unknown

The truly great opportunities for innovation and discovery lie in areas that are not already richly mined.

Use State-of-the-Art Approaches

In this regard, consider training one level more basic than where you feel you are likely to end up. The perspective will be fresh, and the training will be more likely to differentiate you from others.

Do Not Become the Slave of a Single Technique

However, try to master whatever techniques are necessary to test the hypotheses that are identified.

Consider the Relations Between Academia and Industry

Industry is vital to making essential health products, the ultimate “fruits” of biomedical research (eg, drugs, devices, and diagnostics), available to the public. Scientists and administrators in biomedical industries have much in common with their academic counterparts, including levels of personal integrity and commitment to improving the health of the public. However, there are also important differences. The fundamental goal in academia must be the “disinterested” search for truth, whereas (in our capitalist society) in industry, the goal is to enhance the value of the company’s stock, albeit in an ethical manner and in accord with the public interest.

Three Important Don’ts

- Don’t shun industrial support.
- Don’t limit your relations to a single company.
- Don’t get discouraged if you don’t knock the ball out of the park the first time at bat, but do question whether research is the best career for you if you have nothing substantive to show 2 or 3 years after you have completed your research fellowship. Even if you don’t continue clinical research, your experience will greatly enhance your abilities as a teacher, clinician, and critical thinker.

Never Underestimate the Power of the Written or The Spoken Word

- Skills in oral presentation and in writing must be finely honed.
- Always tell a compelling, understandable story. This is one area where the guidance of a mentor can be critical.
- Insist on preparing first drafts of manuscripts in which you are the first author.
- Rehearse talks, not only with collaborators but also with experienced presenters outside your immediate field.
- Begin writing grant proposals early in your career.

We hope that this primer will encourage, rather than dissuade, future clinician investigators to pursue this pathway. No career is nobler; no profession is more rewarding.

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