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A Roadmap for the Twilight Zone Navigating United States Cardiovascular Career Development for International Trainees

Andrew O. Maree, MB, BCh, MSc; Garret A. FitzGerald, MD

Time is a one way street—except in the Twilight Zone!

—Rod Serling, host of the cult CBS television series

Predictions of the demise of US preeminence in the sciences appear to have been exaggerated¹; at least for now, objective measurements of the investment in and the impact of biomedical research in the United States suggest that it continues to dominate Europe, Japan, and China.² The particular inequities of access to healthcare delivery in the United States are well documented,^{3,4} and objective measures of population health suggest that Americans, on average, are seriously disadvantaged, particularly compared with some Europeans.⁵ However, although a disproportionate investment of dollars in health care⁶ may not translate to universal benefit in the US system, it has created well-resourced centers of excellence that, if accessed, have the potential to deliver superior care.⁷ In the case of cardiology, these centers typically have well-established training programs that integrate diversified opportunities for specialized clinical training with access to mentors skilled in basic, translational, and clinical research. The comprehensive nature of these programs and their multiplicity remain unique to the United States and are sufficient reasons for every aspiring cardiologist or cardiovascular physician-scientist to consider seriously a period of training in this system.

Every year, international trainees come to the United States to advance their careers in cardiovascular medicine. In 2006, international medical graduates (IMGs) from 127 countries filled 31% of accredited cardiovascular disease fellowship posts, 33% of clinical cardiac electrophysiology positions, and 46% of the interventional cardiology posts.⁸ In addition to clinical training, the potential for international trainees to perform cardiovascular research in the United States is considerable. Realizing the benefits of the training environment within the United States requires one to become familiar with institutional, state, and federal training requirements and with the sometimes byzantine challenges that are particular to medical graduates from countries other than the United States. This article seeks to provide international trainees with a roadmap for cardiovascular career development in the United States.

Overall Trends in IMG Training and Positions in the United States

The US Information and Educational Exchange Act of 1948 gave international medical school graduates the opportunity to pursue advanced medical training in the United States; since then, many have come, and many have stayed. IMGs comprise foreign national graduates of international medical schools who enter the United States on specific visa status (eg, J-1, H-1B) and US citizens and permanent residents who graduated from international medical schools. Thus, American citizens who complete their education in schools outside of the United States and Canada are classified as IMGs, and foreign nationals who complete their medical training in the United States or Canada are considered US medical graduates (USMGs). Today, ≈ 1 in 4 physicians practicing in the United States is an IMG, and IMGs occupy a third of all cardiology training posts (Figures 1 and 2).^{8–16}

In 1959, the US Surgeon General's consultant group on medical education published the Bane Report, which predicted a 40 000 physician deficit by the mid 1970s. In response, the number of US medical schools was increased, and by 1981 the annual number of USMGs had increased by $\approx 140\%$. In parallel, mechanisms were put in place to incorporate IMGs into the US physician workforce. Between 1981 and 2001, the number of USMGs and IMGs increased significantly, as did the percentage of these doctors who were IMGs (from 20.9% to 23%). IMGs were more likely to be specialists in 1981 but were more likely to be generalists by 2001. The percentage of rural patient care generalists who were IMGs increased by 45% over this period. In parallel, the percentage of hospital-based physicians who were IMGs decreased.^{9,17}

The decline in the number of IMG specialists appears to reflect both increasing competition for specialty training positions and changing USMG career preferences. The number of specialty and subspecialty graduate medical education (GME) positions in the United States has remained relatively static since 1997, when a cap was imposed.¹⁸ Over the same period, the number of USMGs has increased, and their career preference has shifted strongly toward specialty practice and away from primary care. Thus, the general availability of

From the Department of Medicine, Boston University Medical Center, Boston, Mass (A.O.M.); and Institute of Translational Medicine and Therapeutics, University of Pennsylvania, Philadelphia (G.A.F.).

Correspondence to Andrew Maree, Department of Medicine, Waterford Regional Hospital, Waterford, Ireland. E-mail andrew.maree@gmail.com (*Circulation*. 2009;120:1542-1549.)

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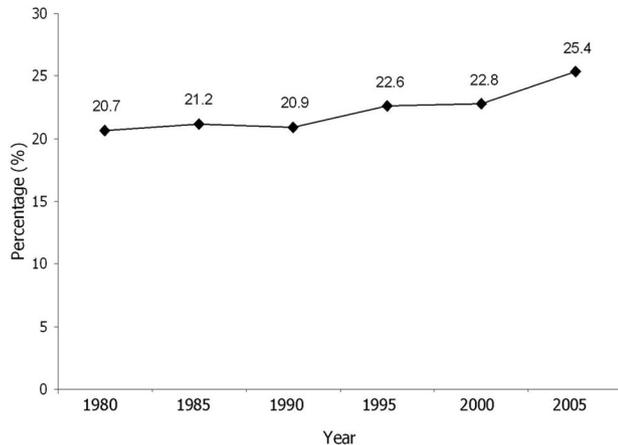


Figure 1. IMGs as a percentage of total active physicians.^{8–16}

specialty training to IMGs in the United States has declined significantly, although to a lesser extent in cardiovascular programs than some other subspecialties (Figure 3).¹⁹ IMGs tend to be accepted initially into primary care training programs. Although training in a primary care field does not preclude eventual subspecialization, the majority of IMGs who finish internal medicine training do not subspecialize.¹⁹ Last year, 3 of 5 first-year residents in family practice were IMGs.¹⁷

In 2005, IMGs comprised 25.3% (228 665 of 902 053 physicians) of the physician population in the United States and $\approx 30\%$ (6615 of 22 114) of cardiologists. They comprised almost one third of all physicians in residency and fellowship training, one third of all hospital-based full-time staff, and almost one fifth of all physicians in research (Table).²⁰ In 2006, IMGs filled 31% of Accreditation Council for Graduate Medical Education (ACGME)-approved cardiovascular disease fellowship posts, 32.7% of clinical cardiac electrophysiology posts, and 45.8% of interventional cardiology posts (Figure 2).²¹

International trainees in the United States received medical degrees from 127 different countries, the largest national groups being from India (19.9%), the Philippines (8.7%), Mexico (5.8%), and Pakistan (4.8%). Recent data reveal increasing numbers of graduates from Pakistan, China, and the Dominican Republic and relatively fewer IMGs from Europe. In excess of 60% of IMGs migrating to the United States come from lower-income countries. There is little doubt that emigration of physicians in large numbers occurs at the expense of the health systems in the source countries and presents a major impediment to disease reduction initiatives in the developing world.²²

Specific Requirements, Specific Challenges, and Additional Training

The Cooperating Committee on Graduates of Foreign Medical Schools, formed in 1954, recommended validating IMGs' medical education credentials and establishing examinations to evaluate skills. The Evaluation Service for Foreign Medical Graduates, later to become the Educational Council for Foreign Medical Graduates (ECFMG), was formed in 1956 and conducted the first medical science examination and the Test of English as a Foreign Language for IMGs in 1958. In

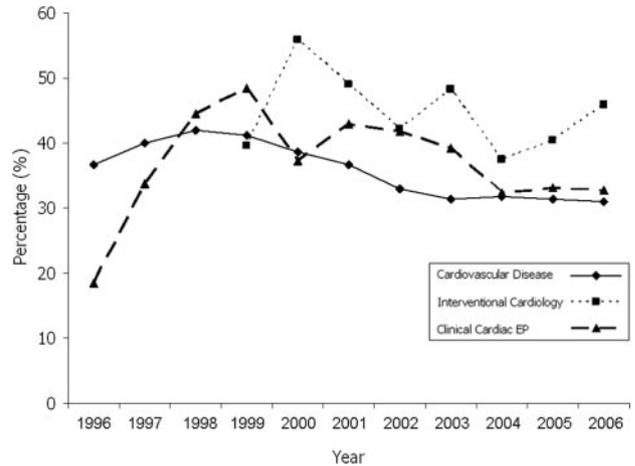


Figure 2. Percentage of IMGs in ACGME-accredited cardiology subspecialty programs.^{8–16}

1974, the ECFMG merged with the Commission on Foreign Medical Graduates, the body that monitored issuance of visas. The Visa Qualifying Examination was replaced by the Foreign Medical Graduate Examination in the Medical Sciences in 1984. The Foreign Medical Graduate Examination in the Medical Sciences ran in parallel with the National Board of Medical Examiners examinations for US medical students and graduates. In 1994, a unifying examination, the United States Medical Licensing Examination (USMLE), was established as the standard assessment for all US and internationally trained physicians. These examinations remain term limited in their validity and not infrequently need to be repeated if a training position and visa are not secured within the allotted time frame. Today, IMGs who wish to participate in clinical training in the United States need to meet the standards of educational preparation (education, examination, and certification requirements) as laid out by the ACGME, state licensure requirements, and federal employment laws (visa documentation).¹⁷

Educational Preparation (Examinations)

Currently, USMLE step 1 (basic science), step 2—clinical knowledge, and step 2—clinical skills must be passed to achieve ECFMG certification. Steps 1 and 2—clinical knowledge are computer-based examinations that are administered by a private company in >50 countries. Step 2—clinical skills can only be taken at 5 centers in the United States and incorporates an English test. USMLE step 3 (a postgraduate clinical examination) is not required for ECFMG certification but is a prerequisite for full medical licensure and certain nonresident immigrant visas, such as the H-1B. Most, but not all, states require the applicant to have completed a minimum amount of ACGME-approved training in advance of sitting for USMLE step 3.²¹ The series of USMLE examinations steps 1 through 3 currently cost $\approx \$3000$. This cost varies for IMGs depending on the international test delivery surcharges levied for step 1 and step 2—clinical knowledge in their region. Additional travel and accommodation costs, and in many cases visa requirements, should be factored in when USMLE step 2—clinical skills and step 3 are taken.

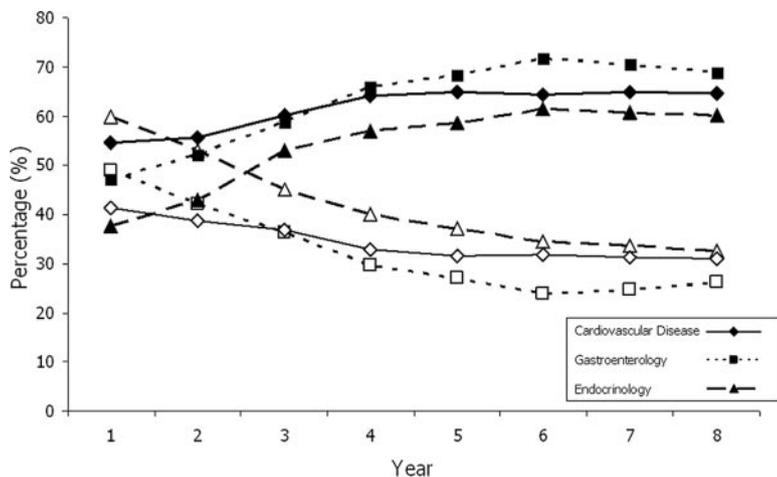


Figure 3. Percentage of USMGs and IMGs by medical specialty in ACGME-accredited specialty GME programs. Solid data points indicate USMGs; hollow data points, IMGs.¹⁹

Federal Employment Laws (Visas)

IMGs entering a research or clinical program in the United States who are not US citizens generally enter under 1 of 2 conditions: either on a temporary, nonimmigrant visa or as a permanent resident. Approximately one third of IMGs who entered medical residency training in the United States in 2006 were on temporary visas (Figure 4).⁸ Although not classified as IMGs, foreign nationals who graduated from schools in the United States and Canada require a visa that allows for participation in clinical programs of GME. Temporary nonimmigrant visas are processed relatively quickly and impose restrictions on duration of residence and controls on the range of authorized employment. Access to permanent residency is determined by national quotas. This status permits an unlimited duration of residence and unrestricted employment, although processing time for an application is considerably longer.

The 2 most common temporary, nonimmigrant visa classifications used by IMGs are the J-1 exchange visitor program and the temporary worker H-1B visa (Figure 4).⁸ There are several J-1 exchange visitor designations, each designed for a specific educational purpose. These include categories such as “student,” “alien physician,” “research scholar,” “short-term scholar,” and “professor.” In general, IMGs who enter the United States on a J-1 visa may not change from one J-1 category to another. This is rarely achieved by petition in exceptional circumstances. For the academic year July 2003 to June 2004, ECFMG sponsored 4159 non-US physicians in clinical residency programs and 2433 in clinical fellowship programs. An additional 57 foreign nationals were sponsored

in the research scholar category. Trainees from India and Pakistan comprised more than one quarter of visas sponsored during this period.²³

An IMG who will be involved in patient care will usually be sponsored on J-1 visas regulated by ECFMG (maximum duration of 7 years) or H-1B visas sponsored by the relevant institution. Historically, approximately half of the IMGs participating in GME programs in the United States were on J-1 visas, although this number has declined of late. An IMG must have graduated from a school that is recognized by the Foundation for Advancement of International Medical Education and Research (minimum of 4 years of ACGME-approved education); passed USMLE steps 1, 2—clinical knowledge, and 2—clinical skills; hold a standard ECFMG certificate without expired examination dates; hold a contract or official letter of offer for a position in a program of GME or affiliated with a medical school; and provide a statement of need from the Ministry of Health from the country of most recent legal permanent residency, regardless of citizenship, to be eligible to apply for a J-1 clinical visa. The GME program in conjunction with the IMG must file an extension application with the ECFMG annually.

Every trainee who enters the United States on an ECFMG-sponsored J-1 clinical training visa is subject to a 2-year home rule requirement. This obliges the recipient on conclusion of his or her training to return and work for 2 years in the country that issued the letter from a Ministry of Health to secure the original visa. J-1 visas preclude change of nonimmigrant status, conversion to H visa status, or application for permanent residency. A limited number of waivers of the 2-year home rule obligation are available. The vast majority of waivers are issued to assist with staffing in medically underserved areas or to facilitate employment by a federal agency such as the Department of Veteran Affairs. In general, the IMG must agree to work for a minimum of 3 years in a federally designated health professional shortage area. Several programs exist to distribute J-1 visa waivers, the best known being the Conrad 30 Program. This program allows each US state to recommend 30 new J-1 visa waivers per year. Historically, IMGs with visa waivers have constituted more than half of all underserved area service commitments.

Table. USMG and IMG Physician Population Overview (2005)

No. of physicians in United States	902 053
No. of IMG physicians	228 665 (127 countries)
Percentage of IMG physicians in United States	25.3
Percentage of IMG in residency programs	28.2
Percentage of IMGs in primary care	37.6
Percentage of USMGs in primary care	31.9
Percentage of IMGs in patient care	80.1
Percentage of IMGs in academics*	16.2

*Faculty level in a university-affiliated program. Data from Smart.²⁰

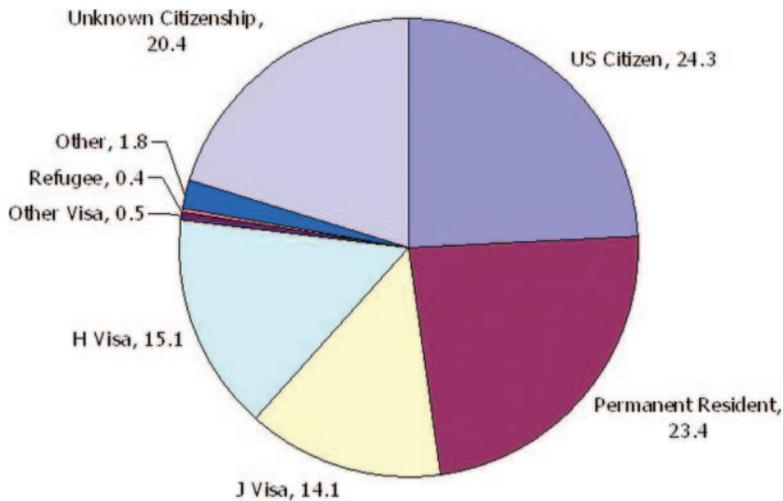


Figure 4. Citizenship and visa status of IMGs in ACGME programs in 2006 (percentage).⁸

Approximately 75% of the IMGs who receive waivers become US permanent residents.^{17,23}

The H-1B temporary worker visa provides for workers in a variety of specialty occupations who hold professional-level qualifications. Initially restricted to IMGs of international renown, this visa is now more widely available and allows physicians to enter the United States for up to 6 years. The physician must (1) have an unrestricted state medical license or appropriate authorization for the position, (2) have an MD degree or a full unrestricted foreign license, and (3) have passed USMLE steps 1, 2, and 3 to be eligible for an H-1B visa. Individual states determine the level of licensure required for the level of clinical activity. Many states offer a limited (training) license for residency, and that level of licensure is sufficient for the H-1B visa. The USMLE examination requires a certain amount of US training before admission to step 3, which creates difficulties for IMGs. However, state licensing authorities set their own rules for administration. A few states permit IMGs to sit for the examination before receiving US training but withhold full licensure pending the IMG meeting the training requirement. Importantly, for the purpose of meeting the examination requirement for an H-1B visa, an IMG may sit for step 3 in any state and use the examination to meet the training requirement in another state. Additionally, a physician may physically sit for a specific state USMLE step 3 examination in any state testing center.^{21,23}

IMGs who enter research programs and will not provide patient care are usually sponsored on J-1 research scholar or H-1B employer visas. The J-1 research scholar visa has a maximum potential duration of 5 years, and the H-1B visa has a maximum potential duration of up to 6 years. J-1 exchange visitor physicians involved in nonclinical programs such as observerships, consultation, teaching, or research programs are not required to have passed US medical licensing exams or to be ECFMG certified. Unlike J visa specifications, requirements for H-1B visas remain the same irrespective of whether the candidate will be involved in clinical practice. Policy on which is the appropriate visa to file for on behalf of an IMG is an option for the sponsor rather than a matter of

law and varies not only between institutions but between divisions of departments within an institution.

Many IMGs, including those with J-1 visa waivers, will ultimately apply for permanent residency (a green card).^{9,18} Physicians and scientists may self-petition for a US green card under several categories. An EB1 applicant applies as an alien of extraordinary ability. This application must usually be supported by a substantial bibliography of peer-review publications, awards, and grants. An EB2 National Interest Waiver applicant may apply on the basis of a 5-year work commitment in an underserved area. Of note, being awarded a green card does not circumvent the 2-year home residency requirement for a J-1 visa holder.²¹

Aligning Career Path and Visa Status

An IMG should carefully consider the visa status that he or she is applying for in advance and ensure that it is compatible with his or her chosen career path and ultimate goals.²⁴ If permanent residency is not available, then a clear understanding of the federal employment laws associated with the available visa status is essential. Entering the United States on a visa that is poorly aligned with the trainee's career path can lead to considerable distress and financial burden later on. Major training institutions have an international office with staff that can anticipate and prevent these problems. Therefore, communicating early in the process with this office is essential.

If an international trainee comes to the United States to train in a research capacity for a finite period of time without any clinical exposure, then the J-1 research scholar visa is most appropriate. If the hope is to do research and ultimately seek a faculty appointment, then an H-1B visa may be more suitable, although the sponsoring institution may wish to delay conversion until the decision to promote has been made. A J-1 ECFMG visa is designed for the IMG who seeks clinical training with or without a research component but plans to leave the United States on completion of training. However, if he or she aspires to stay in the United States beyond training, then an H-1B visa should be sought. Those aspiring for an academic clinical position with teaching and research ultimately at a faculty level should aim for H-1B or

O-1 unrestricted visa status, which is difficult to obtain. Attempts to change from J-1 clinical visa status without fulfilling the terms of the visa are generally unsuccessful, even with assistance from an immigration lawyer at considerable cost. Furthermore, visa waivers that negate the home rule requirement are often in limited supply and should not be relied on.

H-1B visa status is linked to the terms and duration of employment and requires ongoing support from the sponsoring institution. An IMG on an H-1B visa may not receive income from sources other than the sponsoring institution. A dependent spouse and offspring will receive H-4 visa status, which precludes them from working. Additional paid employment outside the sponsoring institution, such as covering on-call duties or "moonlighting," is not permitted. An application to extend H-1B visa status can take several months to process, particularly in the summer months, and the IMG may not reenter the United States if he or she travels abroad after the visa expires. If the extension is approved, an IMG and his or her dependents must visit a US embassy outside of the country to renew the entry visa before reentering. This is of particular relevance to IMGs on annually renewed contracts, in which case the visa is also extended annually.

State Licensure Requirements

Medical graduates who intend to practice medicine require a license issued by the Board of Registration in Medicine of the relevant state. Research can be performed by a license-eligible IMG without licensure or ECFMG certification as long as the research does not involve provision of patient care. "Incidental patient contact" for the purpose of observation, consultation, teaching, or research is permitted under certain visas such as J-1 research scholar. This may occur only while under direct supervision by a licensed US citizen or resident alien physician. A letter must be appended to the form DS-2019 Certificate of Eligibility for Exchange Visitor (J-1) Status delineating 5 predefined conditions under which this contact may be permissible. Activity must conform to state medical licensing requirements.

Verification of medical school education and ECFMG certification are required before issuance of a license. Since April 2002, only graduates of medical schools that are listed on the International Medical Education Directory of the Foundation for Advancement of International Medical Education and Research, a Web-based database,²⁵ are eligible for ECFMG certification. Limited (trainee) licenses to practice medicine are issued to physicians enrolled in postgraduate medical education programs in teaching hospitals. Training must be performed in ACGME-accredited programs or in a subspecialty clinical training or fellowship program in a training facility, which has an approved program in the parent specialty. All physicians, be they USMG or IMG, must complete a training program certified by the ACGME to become eligible for a full license to practice medicine. The number of GME positions is constrained by a cap imposed in 1997, and therefore availability to IMGs is dependent on the number of USMG applicants.¹⁸ In 2007, in the cardiovascular disease section there were 177 accredited programs with 2363 filled places. In interventional cardiology, there were 130

approved programs and 290 filled places. The limited number of ACGME-approved training posts and increasing number of USMGs make it highly competitive to gain places.

Requirements for full licensure vary between states. Currently, an IMG must have completed 2 years of postgraduate training in an approved program and must have passed USMLE step 3 to be eligible for a full license in Massachusetts. In New York State, 3 years of approved postgraduate training is required, and US citizenship or permanent residency status is a prerequisite. Independent of the state, medical institutions have additional credentialing requirements.²¹

Problems arise for an IMG who has done much of his or her postgraduate training abroad and who wants to complete higher clinical training with the ultimate aim of gaining a faculty appointment at a US institution. The international trainee needs to meet the minimum ACGME-approved training requirement determined by the state to be eligible for a full license before taking up a staff appointment. If the IMG secures a training position in an approved program, the duration of his training may still fall short of state licensing requirements. Many IMGs repeat some or all of their training when they enter the United States to negotiate such obstacles. Additionally, IMGs may be encouraged to bring funding to defray the cost of their training in the United States. Some nationalities may have access to scholarship funding that serves this purpose.

Admission to Certification Examinations (Board Certification)

The American Board of Internal Medicine (ABIM) certifies physicians in internal medicine and 18 subspecialties and is a means of confirming the physician's academic credentials, clinical judgment, and skills to the public and his peers. Board certification is not prerequisite to practicing medicine in the United States, but its absence may limit opportunities, particularly for physicians in clinical practice. A physician must complete the requisite predoctoral medical education, meet the ABIM training requirements, meet licensure and procedural requirements, and pass a certification examination to become certified. The ABIM does not recognize postgraduate examination qualifications awarded by jurisdictions outside of the United States and Canada such as membership examinations of the Royal Colleges of Physicians.

Internal Medicine

USMGs must have attended a school that was accredited at the date of graduation by the Liaison Committee on Medical Education, the Canadian equivalent, or the American Osteopathic Association to be eligible for admission to the Internal Medicine Certification Examination. IMGs must have a standard certificate from the ECFMG without expired examination dates. Among the additional requirements, physicians must have satisfactorily completed 36 months of ACGME-accredited graduate medical education. Training as a subspecialty fellow cannot be credited toward the internal medicine training requirements. Clinical competence and procedural skills are assessed annually in each of the 3 years.

As a rule, credit toward certificate examination admission is not granted for training completed outside of an accredited

US or Canadian program. Special consideration and up to 12 months of postgraduate year 1 credit may be granted to a candidate who completed ≥ 3 years of verified internal medicine training abroad before entering accredited training in the United States or Canada. In rare instances, candidates with < 2 years of accredited training in internal medicine in the United States or Canada are considered for admission to the ABIM examination. Before being proposed, the physician must have completed ≥ 3 years of verified internal medicine training abroad, be a full-time internal medicine faculty member, have completed 8 years after formal training as a clinician-educator or a clinical investigator in internal medicine, and hold an appointment at the level of Associate Professor or higher in an Liaison Committee on Medical Education–accredited medical school.²⁶

Cardiovascular Diseases

To become certified in the subspecialty of cardiovascular disease, physicians must be certified in internal medicine by the ABIM, have completed the requisite graduate medical education fellowship training (minimum of 36 months of clinical training in an ACGME-accredited program), have demonstrated clinical competence in the care of patients, meet the licensure and procedural requirements, and have passed the certification examination in cardiovascular diseases. ABIM diplomates in Internal Medicine may be proposed for special consideration for admission to the cardiovascular disease board examination if they have completed the full training required by ABIM in the subspecialty in another country, are full-time internal medicine faculty members who have completed 8 years after formal training as a clinician-educator or a clinical investigator in internal medicine, hold an appointment at the level of Associate Professor or higher in an Liaison Committee on Medical Education–accredited medical school, and possess a valid, unrestricted license to practice medicine in a US state or territory or in Canada.²⁶

Research Pathway

The ABIM offers a research pathway toward subspecialty certification. This program combines training in research with clinical training. Trainees must complete 24 months of accredited internal medicine training. In subspecialties such as cardiovascular disease, the research pathway is a 7-year program. At least 3 years of research training at 80% commitment is required. The research pathway is an 8-year program for interventional cardiology or cardiac electrophysiology. Trainees in the internal medicine research pathway may take the certification examination in internal medicine in postgraduate year 5. The cardiovascular disease subspecialty examination may be taken in postgraduate year 7.²⁶

Research Opportunities and Challenges for International Trainees

Selecting a Mentor

Despite the obstacles to be overcome by the IMG wishing to enter a clinical training program, the points of engagement (Division, Department, and Program Directors) are clearly defined, and the program, once entered, is predictably structured. Research training, pursued in its own right or as a

component of an integrated training program in any aspect of cardiovascular medicine or surgery, presents a distinct set of challenges. The most important decision is the selection of and acceptance by an appropriate mentor. Sometimes, the IMG may encounter in his or her home country a prospective mentor at a meeting. Occasionally, the opportunity may arise at a US, European, Asian, or World Cardiac Society meeting. However, more usually, the IMG is directed to a prospective mentor from within a clinical training program or seeks one by blanket e-mailing faculty at research-intensive institutions. A recent initiative by the American Heart Association will assist with this process. The American Heart Association has established an international mentoring program within its science councils that promotes communication between early career physicians and potential mentors. (The American Heart Association International Mentoring Program can be found online at <http://www.americanheart.org/presenter.jhtml?identifier=3040709>.)

There is no single way to select a superior mentor, but a few guidelines are as follows:

1. Identify someone who has made serious contributions and who continues to run an active laboratory. Typically, you might be attracted by a publication. Is this a “flash in the pan” or reflective of the laboratory’s output? Besides a perusal of the investigator’s Web site, use online resources such as PubMed²⁷ and the h index,²⁸ which reflect the aggregate impact of a body of work, to gauge in a preliminary fashion the consistency of contributions from an established laboratory. The h index is influenced by the field (skewed high by work in clinical trials, for example, low in physics) and by longevity of tenure (misleadingly skewed low for exceptional but junior faculty). A common mistake is to restrict consideration for mentorship to faculty members of the relevant clinical training division. In many instances, the most important research of relevance to cardiovascular biology is performed by faculty elsewhere in the institution. Interpret the issue of “relevance” broadly; the key experience that you wish to derive is the best possible training in science that you can then apply in your chosen field. Have the courage to apply to the most accomplished mentor that you can identify.
2. Identify a mentor who has stability of funding. Particularly in these challenging times, an IMG needs some level of assurance on this issue. This is of both immediate and delayed consequence. First, because the nonresident IMG is ineligible for support from federal training grants, the investigator will need to identify alternative means to accept the IMG into the program. Second, stability of funding is needed to make a front-end commitment for a minimal training period in science (2 to 3 years). Funding information may be accessed in cases in which the investigator has posted his or her National Institutes of Health (NIH) Biosketch on the Web site. Another useful resource is the NIH Computer Retrieval of Information on Scientific Projects.²⁹
3. Identify a mentor whose trainees have been successful. Although this information is gleaned most effectively from current trainees, preliminary information may be available from the investigator’s Web site or by searching for the subsequent productivity of past trainees on PubMed. At the appropriate time, perceptions can be reinforced by perusal

of comments in the most recent review of the relevant NIH training grants.

4. Engage the interest of the selected mentor. Do not send pro forma e-mails; usually they are deleted with minimal perusal. Having selected a prospective mentor, communicate with him or her in a way that reflects the effort that you have invested in his or her selection. Consider what might make you attractive to the mentor. First, your previous track record is important. Include in your curriculum vitae names and contact information of potential referees. These must be individuals who have expressed their willingness to serve in this role and who hold a faculty rank or administrative title that conveys experience and, ideally, wisdom. Second, highlight your familiarity with the work in the investigators' laboratory. Keep your description cryptic but convey a level of interest that extends beyond a vague familiarity derived from a Web site. Third, present a rational reason for selecting this laboratory. Relate your background and, more importantly, your career goals to the proposed training experience. How will this help you to pursue precisely what you want to do? Convey your seriousness and commitment. Do not give the impression that you want the laboratory to be the vehicle that facilitates your visa conversion, which is a certain path to rejection. Fourth, outline the funding opportunities that might be available to you, whether from your own country or from within the United States. Indicate that you are willing to pursue these opportunities with the help of the mentor. Given that you will not qualify for Federal training grant support if you are not a citizen or permanent US resident, the more explicit that you can be, the better. Fifth, offer to visit the laboratory at your own expense. This indicates that you are really serious about this specific laboratory and that you understand that it is as important that you feel comfortable with the laboratory as they do with you. The investigator may respond by funding your visit in whole or in part, but remember, she or he cannot use funds from federal training grants to pay for travel for nonresident IMGs from outside the United States.
5. Determine the selected mentor's level of interest in you. Relationships matter greatly. Is the mentor vested in the career goals of his/her trainees? Is the atmosphere in the laboratory happy or riven with rivalries? How much diversity is there within the laboratory culture? Is the mentor around much or more of an international visitor than you are? What is the organizational structure of the laboratory, or is there one? Do you get along with this person, and do you sense that you can develop a lifelong professional relationship with this person? Ideally, the laboratory phase will be just the beginning of this mentoring experience.
6. Does the proposed project or field of work excite you? If you are to invest the time necessary for serious accomplishment, you will need to be emotionally as well as intellectually invested in this work. Have you the courage to learn new things? Have you the courage to fail and the determination to start again? Unlike clinical work, in which the temporal parameters and specific duties are clearly defined, research is a more free-floating experience: You establish your own boundaries in how you use your time, the magnitude of your effort, and your consequent accomplishment. Will you be focused, and will you be persistent?

Funding Possibilities for Research Training

Much of the industry-independent financial support for cardiovascular research in the United States is provided through the NIH and the American Heart Association. Additional support may be available through programs such as the Fulbright program. Competition for these grants is considerable. The NIH requires that IMGs who work on NIH-funded grants at a US institution who are not US citizens remain at the institution long enough to finish their project. IMGs on a nonimmigrant visa must be able to state that their visa will allow them to remain in the United States long enough to be productive on the project. The NIH also requires sponsoring institutions to ensure that an IMG has an appropriate visa to meet these requirements.³⁰

NIH-sponsored fellowships, career development awards, and training awards stipulate that candidates must be US citizens or permanent residents and that individuals on temporary visas are not eligible. These include the Mentored Research Scientist Development Award (K01), which provides support and protected time for supervised research with the aim of transitioning the recipient to research independence. The Mentored Clinical Scientist Research Career Development Award (K08) provides similar support to individuals with a clinical doctoral degree for supervised biomedical research, and the Mentored Patient-Oriented Research Career Development Award (K23) supports investigators performing patient-oriented research. The Ruth L. Kirschstein National Research Service Awards support predoctoral (F30, F31) and postdoctoral (F32) fellows.³⁰ Training is a major feature of the Clinical and Translational Science Awards,³¹ and many institutions have initiated Masters programs in translational research supported by this mechanism.

NIH research project grants (R01), small grants (R03), or developmental grants (R21) are available to non-US citizens. Although the R01 is the benchmark indicator of independence as a scientist, these grants are fiercely competitive, with initial funding rates dropping toward 10%; the average age of initial award has drifted beyond 40 years and is even higher for MDs than PhDs. Small R03 grants support preliminary and short-term research, and exploratory/developmental R21 grants are awarded to encourage new research in a given program area. The NIH also offers a visiting program to researchers at all career levels. The awards provide for non-US citizens and nonpermanent residents to perform research in 1 of 2 categories. The Visiting Fellows Program provides support for researchers with a doctoral degree in the health sciences, and the Visiting Scientists Program supports independent scientists to conduct health-related research. These awards are generally made for up to 2 years and may not exceed 5 years.³⁰ The Food and Drug Administration has recently launched a training program for extramural scientists.³²

The American Heart Association offers National and Affiliate (regional) Research Program funding opportunities aimed at individuals at various career stages, and each has specific citizenship requirements. The National Research Program grants include a Clinical Research Program, Scientist Development Grants, and Established Investigator Awards. Affiliate Fellowship Programs are relevant to spe-

cific regions of the United States and offer predoctoral and postdoctoral fellowships and grant-in-aid programs. In general, American Heart Association research funding is available to IMGs who hold or have applied for permanent residency and those on most temporary visas. Specific to the National Scientist Development Grant, physician applicants who hold a J1 visa must have H-1B or equivalent visa status by the award activation date. The American Heart Association also offers Fellow-to-Faculty transition awards through the national and affiliate programs. International trainees with US citizenship, permanent residency, and certain nonimmigrant visas such as H1, H1B, and O1 may apply, but those with J1 visa status are not eligible.³³ These awards support research endeavors as an individual prepares for a faculty appointment and are particularly attractive transitional vehicles as an IMG matures professionally as an investigator antecedent to an R01 application and alters visa status.

Conclusion

International trainees need humor, patience, and fortitude as they set out to clear the hurdles necessary for acceptance into the US biomedical environment. The good news is that excellent resources for training both clinically and in cardiovascular research abound. It is hoped that this article will illuminate some of the steps in the process and provide useful guidance to prospective international trainees.

Success is a science; if you have the conditions, you get the result.

—Oscar Wilde

Disclosures

None.

References

1. Rogers Hollingsworth J, Muller KH, Hollingsworth EJ. China: the end of the science superpowers. *Nature*. 2008;454:412–413.
2. The great pretenders. *Nat Med*. 2008;14:695–696.
3. Siminoff LA, Ross L. Access and equity to cancer care in the USA: a review and assessment. *Postgrad Med J*. 2005;81:674–679.
4. Lee TH, Emanuel EJ. Tier 4 drugs and the fraying of the social compact. *N Engl J Med*. 2008;359:333–335.
5. Marmot MG. Status syndrome: a challenge to medicine. *JAMA*. 2006;295:1304–1307.
6. Leonhardt D. A lesson from Europe on healthcare. *New York Times*. October 18, 2006; Business.
7. Coleman MP, Quresma M, Berrino F, Lutz JM, De Angelis R, Capocaccia R, Baili P, Rachet B, Gatta G, Hakulinen T, Micheli A, Sant M, Weir HK, Elwood JM, Tsukuma H, Koifman S, E Silva GA, Francisci S, Santaquilani M, Verdecchia A, Storm HH, Young JL; CONCORD Working Group. *Lancet Oncol*. 2008;9:730–756.
8. Brotherton SE, Etzel SI. Graduate medical education, 2006–2007. *JAMA*. 2007;298:1081–1096.
9. Hart LG, Skillman SM, Fordyce M, Thompson M, Hagopian A, Konrad TR. International medical graduate physicians in the United States: changes since 1981. *Health Aff (Millwood)*. 2007;26:1159–1169.
10. Appendix, II: graduate medical education. *JAMA*. 2000;284:1159–1172.
11. Graduate medical education. *JAMA*. 2001;286:1095–1107.
12. Graduate medical education. *JAMA*. 2002;288:1151–1164.
13. Graduate medical education. *JAMA*. 2003;290:1234–1238.
14. Graduate medical education. *JAMA*. 2004;292:1099–1113.
15. Graduate medical education. *JAMA*. 2005;294:1129–1143.
16. Brotherton SE, Etzel SI. Graduate medical education, 2005–2006. *JAMA*. 2006;296:1154–1169.
17. *International Medical Graduates in the U.S. Workforce: A Discussion Paper*. Chicago, Ill: American Medical Association; 2007.
18. Iglehart JK. Grassroots activism and the pursuit of an expanded physician supply. *N Engl J Med*. 2008;358:1741–1749.
19. Boulet JR, Norcini JJ, Whelan GP, Hallock JA, Seeling SS. The international medical graduate pipeline: recent trends in certification and residency training. *Health Aff (Millwood)*. 2006;25:469–477.
20. Smart DR. *Physician Characteristics and Distribution in the US*. Chicago, Ill: American Medical Association; 2007.
21. *State Medical Licensure and Statistics*. Chicago, Ill: American Medical Association; 2007.
22. Mullan F. The metrics of the physician brain drain. *N Engl J Med*. 2005;353:1810–1818.
23. *Graduate Medical Education Directory 2006–2007*. Philadelphia, Pa: American Medical Association; 2006.
24. Fuster V. Symposium presentations: how to become a cardiovascular investigator. *J Am Coll Cardiol*. 2005;46(suppl):A5–A70.
25. Foundation for Advancement of International Medical Education and Research (FAIMER) International Medical Education Directory (IMED). Available at: <https://imed.fairmer.org>. Accessed July 15, 2008.
26. American Board of Internal Medicine. Become certified by ABIM. Available at: <http://www.abim.org/certification/policies.aspx>. Accessed July 15, 2008.
27. PubMed. US National Library of Medicine and the National Institutes of Health. Available at: <http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed>. Accessed July 15, 2008.
28. Ball P. Index aims for fair ranking of scientists. *Nature*. 2005;436:900.
29. Computer Retrieval of Information on Scientific Projects (CRISP). Available at: <http://crisp.cit.nih.gov>. Accessed July 15, 2008.
30. Office of Extramural Research, National Institutes of Health. Types of grant programs. Available at: http://grants.nih.gov/grants/funding/funding_program.htm. Accessed July 15, 2008.
31. National Center for Research Resources. National Institutes of Health, Department of Health and Human Resources. Available at: <http://www.ncrr.nih.gov/clinical%5Fresearch%5Fresources/clinical%5Fand%5Ftranslational%5Fscience%5Fawards/>. Accessed July 28, 2008.
32. FDA Commissioner's Fellowship Program. FDA US Food and Drug Administration. Available at: <http://www.fda.gov/commissionersfellowships/default.htm>. Accessed July 28, 2008.
33. American Heart Association. Funding opportunities. Available at: <http://www.americanheart.org/presenter.jhtml?identifier=9713>. Accessed July 15, 2008.

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