



# *Gastroenterology's* **MET Corner:**

An AGA Resource for Trainees,  
Junior GIs, and Mentors

**JULY 2011 - SEPTEMBER 2012**

A Compilation of Articles *from the*  
Mentoring, Education, and Training Corner



THE AGA INSTITUTE

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September 2012

## Introduction to the Mentoring, Education, and Training Corner

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Welcome to this new section in GASTROENTEROLOGY entitled, Mentoring, Education, and Training Corner (MET Corner). It will focus on a critical aspect of our profession, the education, development, and support of young learners and protégés.

We are in a period of steady and exciting change across society and the pressures that we face as members of the medical community are a reflection of these changes. Many argue that being a physician, as we've known it, is threatened with transformation from a vocation to a career in which up-and-coming practitioners are forced to be concerned with finishing a shift rather than caring for the patient in a compassionate and thoughtful manner. Young scientists, independent of their degree, are feeling the pressure of shrinking funding margins and the reality of building individual recognition in an environment where team science is flourishing. Moreover, the decreasing number of individuals choosing careers in academic medicine, especially in the physician scientist pathway, is very concerning for the future of scientific discovery and education.<sup>1-4</sup> Despite all of these potential challenges, there are enormous opportunities and intellectual resources that make the present time an extremely exciting one to be part of. In light of this confluence of challenges and opportunities, today more than ever, we need to guide and nurture our trainees to reach their maximal potential as members of our field and do so while maintaining the standards of professionalism in highest regard. In addition, it is essential to provide intellectual resources to the members of our community in an effort to meet the demands of our evolving environment.

The science of learning and teaching in medicine has continued to incorporate pedagogical theory and best practices. The number of scientific publications devoted to mentoring, medical education, and training has grown exponentially over the past decade.<sup>5-18</sup> Opportunities for formal training in research methodology, both in basic and clinical sciences, have also grown (eg, the NIH K

awards: <http://grants.nih.gov/training/careerdevelopmentawards.htm>). Unfortunately, due to the at times frantic pace of our professional lives and the large volume of information published, it is often difficult to stay abreast of the important contributions being made in these areas. Our goal is to provide the readership of GASTROENTEROLOGY a series of mini-reviews on the topics of mentoring, education, and training, bringing to the forefront the evidence available for best practices. Our expert guest authors will provide reviews on a wide array of topics extending from career opportunities in all aspects of our field, to the key steps to success in ones chosen discipline, to gender and ethnic diversity, to training updates, to the balancing of home-life with work-life. We will also address timely topics in education, with the hope of providing evidence-based best practices to become more successful teachers during an era of increased regulation on learner's availability. As part of the process, we will also partner with key committees within the AGA such as the Education & Training and Women's Committees, in an effort to address topics and issues relevant to the membership at large. The material presented will be organized by overarching themes. For example, our initial series of articles will be devoted to a host of topics on mentoring, education, and training within an academic environment. Given the somewhat unique nature of this section as a regular feature, we hope that our readers will find it of interest and will also provide us with input and topics they would like to see covered.

To inaugurate this section we've asked the former President of the AGA Institute, Dr Tadataka (Tachi) Yamada to share his perspective on mentoring. Dr Yamada has had an extraordinary journey through an illustrious career. The journey has included academic medicine, serving as Chairman of the Department of Internal Medicine at the University of Michigan Medical School; industry as Director of Research and Development and member of the Board of Directors at Glaxo-SmithKline; and most recently, his energy has been directed to the realm of charitable enterprise, serving as the President of the Global Health Program for the Gates Foundation. Mentorship has also played a central role in

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Dr Yamada's journey. He has received sage advice from many mentors and he has provided guidance and support to hundreds of individuals within our field. Dr Yamada's extensive contributions to the support and development of others led him to be the recipient of the 2010 AGA Distinguished Mentor Award. In light of Dr Yamada's extraordinary dedication to medicine, science and the nurturing of many careers, we felt that he would be a fitting author for the inaugural edition of this new section dedicated to mentoring, education, and training. Welcome to the MET Corner, and we hope that you will enjoy it!

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## On Mentorship

TADATAKA YAMADA

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When I went to one of my old mentors, Gabriel Makhlouf, many years ago for advice on where to do my fellowship in gastroenterology, he gave me a list of excellent programs, including his own at the Medical College of Virginia (MCV), but in the end he told me, “Go to Mort Grossman at UCLA—he will not let you fail.” In one sentence he encapsulated the essence of mentorship. First, and most important, is the quality of unselfishness. Clearly he wanted me to come to MCV for my fellowship, because almost certainly I would have worked in his laboratory had I gone there, but setting his own interests aside he recommended that I go elsewhere. Secondly, he defined great mentorship as something beyond just friendship or good advice—there should be a successful outcome, however that might be defined. Great mentors are framed by the serial successes of those that they mentor. Success in this sense need not be limited to that achieved in the professional realm. Sage counsel by a mentor on how to be a better person can have far more impact sometimes than career guidance.

I have been the beneficiary of so many great mentors that I have no way to thank them other than by trying, to the best of my ability, to justify their belief in me by emulating them and passing on the traditions they have handed down to those who I mentor in turn. My father was my first mentor; his belief in my future drove me more than he could have known. I often look to my first mentor in medicine as a role model of what it means to be a physician, Dr Marcel Tuchman, a survivor of the Holocaust, who exemplifies kindness and compassion every day that he sees patients. The outstanding gastroenterologists at MCV, where I did my residency in medicine, inspired me to follow in their footsteps: John Farrar, Ed Moore, Reno Vlahcevic, and Alvin Zfass in addition to Gabriel Makhlouf. The people who trained me so ably in my fellowship at UCLA were Jon Isenberg, John Walsh, Neil Kaplowitz, and, of course, Mort Grossman. I learned how to become a chairman of medicine from Bill Kelley. My mentors in business were Jan Leschly and J. P. Garnier, 2 very different people who shared the common gift of leadership. In my present life I have benefited greatly by association with Bill and Melinda Gates, who exemplify what it means to give to fellow humans. Beyond these direct mentors, I am amazed at how much I have benefited from people with whom I never worked as an employee or trainee but in the course

of time I got to know and they took a benevolent interest in my career. The impact of a brief word of encouragement from a leader in the field cannot be underestimated. What is it that my mentors have imparted to me? Perhaps the lessons are best described in a number of vignettes.

I can remember the day I graduated from high school as if it were yesterday. My father had sent me from Japan to a boarding school in Massachusetts 3 years earlier, at 15 years of age, and told me that he was sending me to the best school in America and that of course I would be the best student in the school so therefore I should be the best student in the world. On graduation day, there was a prestigious award that was to go to the student who more than anyone had made the school a better place. As the headmaster was describing the importance of the award and before he announced who won it, I could hear my father, who was sitting right behind me, preparing his camera so that he could take my picture when I won it. To this day, I wonder how I might have felt if I had not won the award, but there is no doubt that his unbelievably high expectations of me have given me the confidence to set high expectations for myself.

Marcel Tuchman was the first attending physician I ever had as a student on the medical service at Bellevue Hospital. In those days, the students at New York University benefited from having 2 attending physicians on the wards: one a full-time faculty member and the other a volunteer from the community. Dr Tuchman was one of the latter, an outstanding clinician who taught us the art of taking a patient history and the fine points of a physical examination. What made him special was the way he treated his patients and the way they reacted to him. He made his patients feel as if there were nothing more important in the world to him than the time he was spending with them. They could feel his empathy and they knew he cared, so things would come from them that they might not have revealed to anyone else, physician or not. Imagining what a harrowing life he had lived in a Nazi concentration camp, his visible compassion seemed to come from a deep well of human kindness that could not be held back by his own suffering. I learned from him what it means to be a physician.



# Mentoring, Education, and Training Corner, *continued*

MCV was known to have a strong clinical program and was located in Richmond, Virginia, very close to where my parents-in-law had recently moved, so I was pleased to have matched there for my residency in medicine. Once there, I learned what an outstanding gastroenterology program really looks like, with excellence in research and clinical medicine in both hollow organ and liver. I began to work in Ed Moore's laboratory in my elective time, and there Gabriel Makhlouf noticed me. One day he motioned me into his office and said, "I've been watching you and you look too clever to be working with Moore." (There was no love lost between the two.) He asked what I was working on, and when I told him, he referred me to some papers indicating that what I was working on had already been done. Despite that inauspicious start, he took an interest in me, talked to me nearly every day that he saw me, helped me with my research, and then continued to serve as a confidante, friend, and advisor to this very day, long after my residency came to an end. From him I learned that mentorship is selfless, is lifelong, and extends beyond geographic proximity.

Mort Grossman was one of the giants in gastrointestinal physiology, so I was delighted to be able to train in gastroenterology at UCLA in the program that he founded. Before I went there, I had confirmed that I could work in his laboratory, so I was surprised when he recommended that I consider carefully whether I might not work with some of the younger and more advanced scientists at UCLA, such as Andrew Soll, John Walsh, or Neil Kaplowitz. As it turned out, I ended up working with both Neil and John, but I marveled at Mort's dispassionate and honest assessment that my future was better off in their hands than in his. Nevertheless, Mort found ways to continue mentoring me. Once he gave me a paper that he had been asked to review for *GASTROENTEROLOGY*. I studied the paper, and with great scholarship I shredded it to pieces and gave my review to Mort, hoping he would approve of my cleverness. The next day, he returned my review with a penciled comment at the top saying, "Now I want you to write me a report and give me a reason why it's a fantastic paper and how we could make it even better." Sometime later, I received an invitation to look at a job at the University of Michigan. I told Mort that I would not even consider leaving him at that time because he was terminally ill, and he told me, "Look, I'm dying and you have a long career ahead of you. Go look because you'll never know what you might find." From him I learned that there is no substitute for wisdom to be a great mentor.

I first went to Michigan to interview for the job as head of gastroenterology at the Ann Arbor VA Hospital. After I gave a talk, the chairman of the Department of Internal Medicine, Bill Kelley, took a serious interest in me and offered me the job. For many reasons I refused, and then

he came right back and told me that he was going to come to me with an offer to become the chief of the entire gastroenterology division. A few weeks later he created a package, came to visit my laboratory at UCLA, and offered it to me in person. Again I refused, saying that since I was only 2 years out of my fellowship, I might not be ready for such a big position. Amazingly, he said that I was the one he wanted and so he would keep the job open for me until I thought I was ready! True to his word, when the time came a year later, he welcomed me onto his faculty. In this way, he recruited an amazing cadre of young academics with outstanding futures, such as Francis Collins, Craig Thompson, and Gary and Betsy Nabel, among many others. The way he recruited us and fostered our career development was to ask us what we hoped to accomplish, give us the resources needed to succeed, and then hold us accountable for achieving our aims. From him I learned that a good mentor recognizes and appreciates talent and then allows that talent to bloom not just with advice but also with access to real resources when they can be provided.

A few years after I had succeeded Bill as chair of the Department of Internal Medicine, I was approached by an executive search firm about joining the board of directors of SmithKline Beecham. The only thing I knew about the company was that it had made Tagamet, the first really effective ulcer drug, but I was intrigued to learn something about business and so I pursued the opportunity. Once I joined their board, I came to know Jan Leschly, who was their chief executive officer. Jan is a Dane with sharp intelligence and an outsized personality. He is the kind of person who would get on the elevator in the morning, and by the time he reached the 24th floor, where his office was, he had gotten to know everybody else in the elevator and made them feel good to start the day. He was a great believer in teamwork, but he was also a great believer in accountability. Being the professional tennis player he once was, he always used to say, "If you're not keeping score, you're just practicing." He convinced me that making a medicine that improves the lives of millions of people would be a fitting outcome for all the training I had received in medicine and science. The experience of working with 15,000 people in R&D at SmithKline Beecham/GlaxoSmithKline, all with a deep sense of mission to make the lives of patients better, was exhilarating. At the end of the day that by itself was not enough; as Jan had taught me, we had to "keep score," and that was in the lives we saved with good medicines.

While I was at GlaxoSmithKline, we were involved in an ill-advised industry lawsuit against Nelson Mandela over the price of medicines for human immunodeficiency virus. This embarrassed me deeply and made me wonder if I could stay in the industry, but to atone for such behavior, I was able to convince the company to set up a

laboratory that made medicines only for the developing world. In this effort, we partnered with entities such as the Medicines for Malaria Venture and the Global Alliance for TB, who were grantees of the Bill & Melinda Gates Foundation. When I went to visit the foundation to discuss our programs, I met Patty Stonesifer, then its chief executive officer, and after a short conversation she asked if I would consider leading its effort in global health. The opportunity to impact the lives of the poorest of the poor with technology-based health solutions was one that I could not turn away. From the first day I met with Bill and Melinda Gates, I have been awed by the purity of their conviction that all lives have equal value and their commitment to give everything they have to support that belief. I have learned from them what it means to be an “impatient optimist,” which is how they view themselves. If one is not optimistic about the future, it is hard to commit to something wholeheartedly, but it is also important to be impatient to get to a better place—in this case, each day of waiting costs immense suffering and unnecessary death. I get the sense that when Bill wakes up in the morning, he counts the lives that have been lost the night before and finds it unacceptable. Of course, those of us who do the work to address the problems find it exhausting to keep up with his impatience, but at the same time there is no comparable gratification than to see the impact of our labors in the field. From Bill and Melinda I have learned that serving as a great role model can sometimes be the best mentorship possible.

Not all of my mentors have been people that I have worked with closely. Some, like Kurt Isselbacher, were people that I tried to work with but could not. Others like Sid Cohen, Allan Hofmann, and Rudi Schmid were people who recruited me but whose offers I chose not to accept. Some, like John Fordtran, were people that I just got to know over time, and some have been career-long friends, like Haile Debas and David Alpers. They have been important role models, and I have benefited greatly from their wise counsel over time. More importantly, I have always sensed that they were watching over me and rooting for me to succeed. For more than 25 years now, I have been a member of the National Advisory Committee of the Robert Wood Johnson Harold Amos Medical Faculty Development Program. This program was started to address the shortage of minority role models in med-

icine and was based on the premise that to succeed in academic medicine one needed not only resources but also strong mentorship that would provide an entrée into the “old boys’ club” of academic leaders. This program has been successful beyond our wildest dreams, having produced countless academic leaders, including university presidents, medical school deans and department chairs, NIH institute directors, and members of the Institute of Medicine. In this same way, I feel that the iconic leaders in gastroenterology who took an interest in me have had a hand in the advancement of my career.

How do I impart these many lessons that I have gained over time to those who I have the privilege of mentoring? When I was in academia, mentoring was part of the professional culture. I think I tried to mentor from the time I was an intern to the day I left academic medicine. Often the mentoring was done on a one-on-one basis in discussions over a patient. Other times it was more intentional and in groups. Some of my fondest memories are of sessions I had with the gastroenterology fellows at Michigan each Friday at 5:00 PM. Whatever we were doing at that time we would drop to come together and talk about anything, but it was always to impart lessons learned onto the next generation of gastroenterologists. When I left Michigan, I learned that the hunger for mentorship is universal and properly provided can have an equally impactful effect outside academia. I have confirmed that mentorship extends beyond the walls of current employment; many that I mentored in academia I still mentor from a distance. I realize now that mentorship is a lifelong process of give and take. One is never too old to have mentors, as I have continued to benefit from the counsel of new and old ones even after establishing my own career. I have learned above all that those I have mentored have enriched my life, and I revel as much as they do in their successes. Hopefully it will lead to a world that gets better each day by continuing to build on the wisdom of past mentors.

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#### **Conflicts of interest:**

The author discloses no conflicts.

## Gastroenterology: A Field With Endless Career Opportunities for Physicians and Scientists

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Gastroenterology is an exciting and burgeoning field that provides an extraordinary number of career opportunities for physicians and scientists. The unique blend of intellectual and procedural-based clinical practice coupled with the excitement

surrounding scientific discovery has made gastroenterology an extremely popular career option. Moreover, the financial compensation and security within the field is certainly not a deterrent. The first American Board of Internal Medicine certification in GI was in 1941 when only a total of 8 individuals certified in this subspecialty.<sup>1</sup> Growth has been steady with >4000 individuals certifying in GI per decade since the 1980s,<sup>1</sup> with approximately 14,000 practicing gastroenterologists in the US today. The number of internal medicine residents applying to GI fellowships has risen over the past 5 years with 585 applicants in 2007 and 627 in 2010, with a match rate ranging from 47% to 55%, respectively.<sup>2</sup> There has been a modest rise in the number of first-year fellows in GI training programs over the past decade with 352 in 2001 and 470 in 2010,<sup>2</sup> which poses some concern regarding the ability to meet the demands for gastroenterologists to care for our aging population in the future. The main reason for the limited growth in GI fellows has been the existing cap on the number of CMS-funded slots available for graduate medical education.

The exponential growth of scientific discovery in the domains of pathophysiology, diagnosis, and therapy of gastrointestinal disorders has led to the realization that incremental specialization within our field is necessary. There has been an increase in the number of subspecialty tracks (interventional endoscopy, hepatology, transplant hepatology, motility disorders, and inflammatory bowel disease), within training programs and clinical practices in response to the need for targeted expertise in the field. In fact, it is precisely this level of subspecialization and

dramatic growth in scientific discovery that has led the AGA Institute Future Trends Committee to recommend a paradigm shift in gastroenterology training, such that the demands/needs of the future can be met.<sup>3</sup>

### General Aspects Regarding Career Selection

Most would say that career selection must be driven by a host of factors, with passion for the field or discipline leading the list. Other key variables include the vision of the individual's professional destination, family priorities, economic factors, impact of mentors, and opportunities that become available over time. The career opportunities in GI are many, extending from the pursuit of an academic position to selection of 1 of several private practice models. In addition, opportunities in nontraditional venues such as industry, finance, hospital administration, law, medical media, and consulting exist.<sup>4</sup> It is clear that complexity and expansion of medicine and science coupled with the changing health care and economic environment have transformed the traditional career opportunities available. In addition, generational change over time has moved young practitioners away from focusing primarily on "the career" as has been the case for "baby boomers," to seeking a profession with variety and balance, incorporating family and personal interests into the mix.<sup>5</sup>

### Career in Academic Medicine

Academic health centers play a vital role in our society and are essential to the well-being of our communities. Discovery of new knowledge applicable to health and disease, education of the next generation of physicians and scientists, and provision of care to the communities where they are located (and beyond) are the 3 missions of academic health centers. The career opportunities in academic gastroenterology are extensive. Scientific discovery has ushered an era of excitement and possibilities not witnessed in the past. Although academic jobs are less lucrative than private practice, they



provide a level of autonomy, flexibility, and general satisfaction that is difficult to parallel. Despite all of the attributes surrounding academic careers, there has been steady concern with the relatively small number of individuals who seek this career path, both in the United States and abroad.<sup>6</sup> There has been particular concern with the paucity of individuals pursuing basic science investigation as a career.<sup>7</sup> Oxentenko et al<sup>8</sup> examined whether there were specific factors that lead GI fellows completing training at The Mayo Clinic over a 10-year span to select private practice or an academic career. In final analysis, it seems that several factors, including race, gender, military background, and interest in pursuing an advanced fellowship, may play a role in choosing an academic position. More recently, Adler et al<sup>9</sup> performed a National survey of US gastroenterology fellows in an attempt to examine the factors that drive selection of an academic or private practice career. After analysis of 184 surveys (14% response rate), the authors made several observations. First, the perception that a nonacademic salary would better meet their financial needs led individuals to select a nonacademic job. Next, the authors observed several characteristics of the individuals surveyed that predisposed selection of an academic career. These included older age (>35 years), having previously attained a graduate degree (Master's or PhD), a desire to work fewer hours, and having an interest in advanced training. These individuals were also interested in performing research and publishing. Additional findings were that 60% of respondents would select academic over nonacademic jobs if salaries were equal and that debt as well as a positive mentoring relationship did not impact career selection. Others have postulated that physicians within academia would benefit from increased attention to ensuring that there is clear alignment between their "inner direction" and the meaning of the work they are pursuing. It is only in this manner that professional fulfillment and true job satisfaction can be achieved.<sup>10</sup> Borges et al<sup>11</sup> performed a literature review to examine how, when, and why physicians select a career in academic medicine. Although definitive answers to their questions were not achieved, several observations were made. Personal and institutional values were important in making this decision; prior training in research, gender, role models, and mentors play a role in this process; loss of interest in academia during residency training years owing to their personal observations of an academic environment impacted negatively on their decision to pursue academia, and debt may have a negative influence on making this decision. O'Sullivan et al<sup>12</sup> performed a qualitative, cross-sectional study of a cohort of students, residents, and faculty members at a research-intensive medical school in an attempt to understand what factors influenced these individuals to pursue academia. Five

themes were identified as playing a positive role in selecting an academic career, including early exposure to research, mentors and role models, well-defined career pathways, interplay of personal and social factors, and career support for junior faculty. Based on these observations, the authors suggest that greater opportunities in research should be structured within undergraduate and graduate medical education to motivate young learners to pursue this career path. Moreover, support for junior faculty to build on their potential to be effective role models for young learners should be strongly considered.

Over the years, careers within academia have moved away from the traditional model where the academician was viewed as a triple threat (clinician, educator, and investigator). The rapid evolution of science and the complexity of clinical practice have led in turn to the development of career paths that are more focused on each one of the traditional missions of an academic health care center. Many institutions utilize tenure and nontenure tracks as the career foundation, with each track populated by individuals that focus on research, patient care, and education to varying degrees. Within each track, there are professorial ranks that include instructor/lecturer, assistant professor, associate professor, and professor. There are also institutions, like the University of California system, that have a greater number of tracks, each specifically designed to meet the needs of the academic environment. Ultimately, one must be familiar with the local options and must clearly understand the goals and expectations for each of the career paths. Moreover, the meaning of tenure varies from institution to institution; paying close attention to these factors is key when selecting a faculty position.

Although not identical to other institutions, the faculty tracks at the University of Michigan bear general similarities to those found in several other academic centers. Therefore, I briefly review them herein as an illustrative example of an academic career pathway. In the instructional or tenure track, the expectation is that faculty devotes the majority of their time to biomedical investigation, be it basic science, clinical, or translational in nature. Early on, protected time performing research is essential, and time devoted to this endeavor should be in the 75%–80% range. Protected time for clinical investigators is also critical, but 50% protection is reasonable given that much of the research carried out by clinical investigators involves patients they see in their clinical practice. Promotion through the ranks and achievement of tenure depends on success in achieving independent funding, steady publications in peer-reviewed journals, excellence in service, teaching, and national (for assistant to associate professor promotions) and international (for associate to professor promotions) recognition. Achievement of tenure is time sensitive and may vary from institution to institution, with 7 years being a typical period within which

tenure must be achieved, although some institutions have a 10-year tenure clock. Therefore, the benchmarks for being promoted and reaching tenure are institution dependent and the office of faculty affairs for the specific department clearly articulate and make readily available their guidelines.

There is a nontenure research track, with 2 pathways—the research professor track and the research scientist track; the former includes an expectation for faculty to teach in addition to performing biomedical investigation.

The most recent nontenure track developed at the University of Michigan, which also exists in many peer institutions across the country, is the clinical track. The clinical track was designed for individuals whose career focus is primarily in the domains of clinical care and education with less emphasis on organizational service and scholarship. A mandate for promotion through the ranks does not exist in this track, although it is a desirable expectation by the institutional leadership. Promotion is dependent on providing evidence of scholarship (publications, national and international presentations, etc) and organizational service. It is important to note that the requirements regarding number and type of publications needed for promotion are more flexible than those required on the instructional track, although again, there are variations across institutions.

It is clear that there is a growing trend, although not mandated, for individuals to build formal graduate training into their portfolio as a way of enhancing the potential for a successful career in the chosen field. This is particularly true for individuals interested in clinical investigation and medical education. The process to navigate the pathway to successful promotion and tenure within an academic medical center will be the subject of future articles in this section of GASTROENTEROLOGY.

## **Career in Private Practice Gastroenterology**

Private practice opportunities continue to attract the greatest number of fellowship graduates, with approximately 85% of current gastroenterologists practicing within a private environment. Scientific advancement, changing rules for reimbursement associated with increasing economic pressures surrounding health care coupled with heightened specialization, and an invigorated process of quality improvement have been steadily changing the paradigm of clinical practice as we have traditionally known it. National organizations predict shortages in the physician workforce. Specifically, the mean age of practicing gastroenterologists is 54–55 years, consistent with steady attrition as existing practitioners retire. Finally, the shifting priorities of more recent generations, wanting to move toward more balanced lives, have led to a rise in young practitioners seeking alternative models of practice such as part-time opportunities

with a greater level of job diversity. Practices have increased diversity in clinical practice by developing centers of excellence within areas of gastroenterology, such as inflammatory bowel disease and motility disorders.

The financial pressures of running a practice and potential for economy of scale when investing in new and necessary initiatives such as an electronic medical record, have led practices to consolidate, moving away from the smaller group model to larger, standalone groups. Of current gastroenterologists in private practice, 60%–70% are in either large consolidated specialty groups or hospital/health care organization–owned multispecialty groups. Approximately 45% of current practitioners are within a multispecialty group practice and 55% are within independent single specialty groups (although detailed data are needed, these numbers are based on general estimates from leaders in the field; John I. Allen, personal communication). In the former, approximately 60% of individuals are based in a physician- or hospital-run organization with the remaining physicians working within an independent, multispecialty group. Although the traditional trend had been for gastroenterologists to choose small practices (1–3 members), the current trend is for individuals to select or move to larger, single-specialty practices (16–75 members). Larger groups provide flexibility, expanded breadth of care, and ease in coverage of a clinical service, as well as enhanced financial security.

Survey data point toward higher salaries and greater predictability of time management as major reasons why individuals prefer a private practice setting. Characteristics of the private practice job that are less attractive include the time-intense schedule, the need for steady productivity, and the concern for burnout. Practices are addressing these negative issues by looking to provide more flexible schedules and increasing the emphasis on focused involvement in narrower areas of expertise within the field. The greatest challenges ahead for practice settings include the unknown impact that health care reform will bring including the introduction of accountable care organizations, changes in reimbursement models, and the overall reliance that the field has had over the last decade on the performance of screening colonoscopy. The later issue needs to be met with development of innovative models of care where expertise in fields such as obesity, cancer, and imaging are developed to meet the demands of the future.

## **Career Options for Individuals With a PhD**

Individuals with a PhD have a broad range of career opportunities in gastroenterology. In addition to being recruited into a clinical or basic science department as a tenure-bound investigator or as a research scientist, opportunities in industry, education, law, and media and

communications exist. Approximately 50% of individuals pursuing a PhD do so with the intent of entering an alternative career such as industry, education, policy development and communication (K. Barrett, personal communication). As with their MD counterparts, funding uncertainties, particularly given the current US National Institutes of Health climate, coupled with the complexity of academic life and the salary differential make industry a more appealing career choice for some. In addition, a career in industry provides the opportunity to be part of the application side of scientific discovery, through development of new drugs or diagnostic tools. Finally, there is a limit to the number of traditional research positions available, even within industry; thus, the realization that the training paradigm for PhD students needs to expand to incorporate some of the tools required to be successful in other domains within academia and industry including management, marketing, quality assurance, production, strategy, intellectual property, and regulatory affairs.<sup>13</sup>

There has also been recognition that PhDs need specialized training if they are to pursue alternative careers in education. For example, in 1998 the National Institute of General Medical Sciences initiated the Institutional Research and Academic Career Development Awards. The primary goal of this innovative program is to facilitate the development of postdoctoral candidates toward research and teaching careers in academia. The program combines development of teaching skills with traditional mentored postdoctoral research experience through active partnership with a minority serving institution. There are also innovative PhD program in which additional training through an MBA or participation in a media fellows program can be pursued.

## Concluding Remarks

Gastroenterology is an exciting and expansive field that provides a large menu of career opportunities for physicians and scientists. Biomedical discovery coupled with social and political change are transforming the career options available into ones in which the needs of our society and practitioners are being met. Passion should be the guiding force behind the decision of choosing a career coupled with thoughtful guidance by mentors and advisors. A clear understanding of the expectations to be met within one's selected organization, be it private or academic, is essential for success in any career path chosen.

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## Mentorship in Academic Medicine

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Medicine and science have become increasingly complex, involving individual pursuits, collaborative efforts, and institutional and national objectives, all in the context of a dynamic society and government. To that end, mentorship requires even more attention

for trainees, new faculty members, and even established faculty members in an academic medical setting. In fact, Feldman et al<sup>1</sup> recently observed that having a mentor was associated with greater satisfaction with time allocation at work and with higher academic self-efficacy compared with those without a mentor. This commentary covers definitions of mentorship in academic medicine, identifies the constituencies, clarifies the specific issues between mentor and mentee, underscores milestones and targets, proposes how to measure outcomes, and suggests approaches to mentorship that might be applicable nationally. The importance of mentorship in community practice is highly relevant and will be covered in a future article in this section.

### How to Define Mentorship?

*Mentorship* comes from Greek mythology; Mentor was a loyal advisor of Odysseus, and teacher of his son, Telemachus. Throughout history, a mentor has come to be equated with a prudent advisor who serves as a teacher or coach. At times, the mentor-mentee relationship is viewed as vertical or hierarchical and self-limited in time. Rather, we advocate mentorship as a horizontal interaction between mentor and mentee. In fact, the words “trainee” and “junior” faculty serve to reinforce historic divides and misperceptions. We recommend using the terms “mentee” instead of “trainee,” “new” faculty instead of “junior” faculty (it is difficult to contemplate how some in their 30s or even early 40s are “junior”), and “established” faculty instead of “senior” faculty. It might seem rather trivial to dwell on semantics, but these terms are so engrained in academic medicine, and in some ways

have served to perpetuate stereotypic behavior. Hence, the mentor-mentee relationship has to be one of mutual trust and that is invigorating for both parties. Moreover, the mentee should play an active role in facilitating and assisting the mentor in developing a true collaborative and productive relationship.<sup>2</sup> The relationship needs to be, and should be, lifelong and not restricted by geography or divergent interests. The parties should continue to embrace each other well beyond completion of fellowship or when a new faculty member leaves a particular institution.

### Who Are the Constituencies?

The mentor is typically an established faculty member, preferably in the same discipline of gastroenterology, hepatology, and pancreatology, but this is not mandatory. Depending on the focus, mentors from other disciplines—other divisions in the department of medicine, pathology, radiology, surgery, basic science departments, epidemiology and health services centers, just to name some—can serve in this role. In either scenario, a co-mentor, who complements the primary mentor, is useful. The nature of the co-mentor may be “content” related or provide yet another perspective on professional and career development issues. It is not wise for the mentor to be “off site” because of the limitations imposed on direct face-to-face meetings; however, it is conceivable that the co-mentor could be at another institution, which would require a structured format to ensure regular meetings and communication (eg, via e-mail, Skype, phone, or face to face).

We define the mentee for purposes of this commentary as fellows and new faculty, recognizing that a number of approaches are different for undergraduate students, medical students, graduate students, combined degree students, and interns/residents, although, of course, they are critical and constitute the “pipeline” of talent and future leadership. Approximately 550–600 new fellows enter GI fellowship training each year, resulting in a total of 1650–1800 GI fellows at any given time. “New” faculty, defined arbitrarily as those within 5 years of fellowship, add another “several” hundred individuals to the



pool of mentees in need of qualified and interested mentors. New faculty encompass divergent fields such as basic science research, translational research, clinical investigation, epidemiology/health services research, physicians engaged in clinical practice, teachers, and administrators. Certain features are common to all fellows and new faculty at their respective stages; however, others are more unique. Thus, the need for a broad array of established faculty to serve as mentors to this large pool of trainees and new faculty in gastroenterology is apparent.

Special aspects of the mentor-mentee relationship include, but are not restricted to, gender,<sup>3,4</sup> underrepresented minority (URM) status,<sup>5,6</sup> disadvantaged background (whether financial, family, or physical infirmity), work-family balance, financial debt, and personal health. Both the mentee and mentor need to be willing to address each of these issues in an open, trusting, and transparent fashion. In addition, institutional leadership should recognize the essential nature of the mentoring process and provide support and resources to faculty and trainees to ensure that productive and durable mentor-mentee relationships are promoted.<sup>7</sup>

## **Relevant Issues to the Mentor-Mentee Relationship**

In view of the tremendous importance of the mentor-mentee relationship, it is key that both parties consider carefully several important issues before committing to such a long-term endeavor. First, it is vital that there be good “chemistry” between the 2 individuals. It is essential that both parties feel comfortable in discussing a number of issues, professional and personal, light-hearted and sensitive. It is easy to identify and highlight one’s strengths, but it is equally, if not more, important to be willing to discuss weaknesses and how they can be overcome. Such frank conversation requires tremendous trust and security. Although issues of gender and ethnic background may be topics of discussion, it is not imperative that the backgrounds of the mentor and mentee be the same. For example, from an URM perspective, there simply are not enough mentors available.<sup>5</sup> Many of the current established academic faculty have enjoyed very successful and long-term relationships with mentors of different gender and ethnic backgrounds. Rather, availability and interest on the part of both parties are crucial. Typically, these characteristics pertain to the mentor owing to institutional, national, and travel demands. A particular potential mentor may be identified by the mentee based on broad national/international reputation. Such a potential mentor may well possess outstanding mentoring skills, but because of excessive time and travel demands, he/she simply may not be available to communicate regularly to the mentee and such a relationship will likely atrophy in a short time. Although

established academic faculty have many demands on their time, it is not unheard of for a mentee to declare that they have conflicts that require cancellation or postponement of the mentor meeting. Although overlapping demands on time certainly arise, requests for delaying or canceling mentor meetings can convey lack of interest. Equally important as scheduled meetings is the understanding that the mentee is welcomed to drop by if emergent or urgent matters arise.

Critical issues of relevance in the mentor-mentee relationship<sup>7,8</sup> include professional and career goals, research interests, development as physician, teacher and/or investigator, and work-home balance. Most likely, a mentee seeks to identify mentors who have achieved much of what they themselves envision for their careers. For example, a new faculty member interested in pursuing endoscopic research and becoming a clinical professor of medicine would benefit more from the advice of a mentor who had achieved that goal than from a research professor of medicine whose focus was on a basic science topic. Such selections, however, may not be available at every institution; therefore, it is important to be open minded and formulate which mentor characteristics are most important to the mentee and broaden the search field across disciplines to enhance the opportunity of finding someone who best fits the mentee’s needs. In this case, consideration of identifying an offsite co-mentor to complement the qualities of the institutional mentor would be beneficial. It certainly is not critical that the areas of research or scholarly focus are identical, but typically it is helpful if they are related at some level so that discussions regarding the status of the field and obstacles faced can be discussed and advice given. Overall, however, it is essential that the relationship “feel” right; the hope and expectation is that this connection will endure and become not only beneficial professionally, but respected and enjoyed on a personal level for many years.

Despite great strides being made toward gender equality in the workplace, there remain situations where the pressures and demands of childcare and their influences on career development must be considered. Often, but certainly not always, such issues fall on the shoulders of women. This responsibility may be real or perceived, but the result is the same. We live in an era where in the majority (58%) of families with children under 18 years of age both parents work outside of the home (US Department of Labor, Bureau of Labor Statistics, 2010). Having no home-based individual to handle domestic responsibilities and child rearing puts extra strain on career progression for both women and men. In some circumstances, more of this responsibility falls to the woman or she may prefer to take the lead in this role. Either way, the consequence is that one’s attention is split between academic pur-

suits and motherhood. Being the mother of young children is a special and finite time. The competing demands for time and attention can create internal conflict and guilt that need to be reconciled by the mentee and, at a minimum, understood by the mentor. Many institutions have adjusted the tenure clock (e.g., to a 10-year tenure clock) to better allow for success both at work and at home. It is important for a mentor to understand the importance of such balance and to be accepting and supportive of these options should the mentee opt for one of them. It may be easy as an established faculty mentor who survived those trying times to forget how difficult the work-life balance can be for a trainee or new faculty member, but in working with and advising these young, bright, and driven individuals, it is critical to recall those times and advise accordingly. Parenthood should of course never be an excuse for failing to progress in one's career; rather, the topic to be grappled with is how to best economize one's time and succeed at both. In maintaining and nurturing the mentee-mentor relationship, it is imperative to be comfortable in discussing this sensitive topic despite the gender of either party.

Another key issue relates to URMs in the field of gastroenterology. Recent surveys and commentaries indicate improvement of recruitment and retention of URM to medicine, but key barriers still exist in terms of promotion and obtaining leadership positions.<sup>5,6</sup> Although issues of academic medicine are common to all types of mentees, specific issues to URM should be addressed and institutional efforts should be linked.

## **Establishment of Milestones and Measurement of Outcomes**

It is important to establish milestones, both short term and long term, and ensure that such milestones are achieved. If the milestones are not achieved, then it is equally important to understand the underlying responsible reasons and adopt alternative strategies. This might involve modification of milestones and/or pursuing different approaches.

How does one measure success? This cannot be so rigid that creativity or innovation are suppressed, but at the same time, some aspects seem to be immutable. In relationship to research, presentations at local institutions, regional societies, and national meetings are important. Publication(s) should emerge from such presentation(s) in appropriate journals, requiring an outline, manuscript preparation, and submission for review, all with timelines. Depending on the type of research, application(s) for grant funding to national societies, private foundations and federal sources (NIH and non-NIH) is appropriate toward the end of fellowship and early during a new faculty position. The

rationale for grant funding relates to protected time for research, but perhaps even more so as a vehicle to build a research team or infrastructure as well as open new avenues of collaboration. Professional advancement at each stage, whether at the local institutional level and/or at the national level, is key and involves "networking" directly and through the mentor's network. This involves working on committees, task forces, and implementing strategies for the particular organization. Striving to acquire and nurture skills in management and leadership are essential.

## **Proposed Pathway**

We suggest the following "concrete" measures to facilitate mentorship:

1. Monthly meetings with a mentor/co-mentor if at same institution (additionally, regular contact with the mentor through informal conversation and e-mail). If not at the same institution, regular contact by telephone and e-mail and direct meetings at regional/national conferences.
2. Instruction in manuscript writing, grant writing, PowerPoint presentation, public speaking involving mentor, institutional resources, national resources (eg, NIH/NIDDK for K grant recipients, Academic Skills Workshops).
3. Instruction in regulatory affairs (IRB/HIPPA, IACUC), bioethics, responsible conduct of research, and professionalism. Such instruction is typically required by training grant trainees, but may need to be sought out if not readily accessible.
4. Building pathways to promote efficiency at work as a means to augment balance with personal and family needs.
5. Awareness of special issues related to women, URMs, and disadvantaged individuals.
6. Convening an advisory committee of 3–4 experts in mentee's field(s) of interest once or twice a year as a platform for further advice and input. The chair of the advisory committee need not be the mentor. Ideally, the chair should prepare a report for the benefit of the mentor and mentee.
7. Design and implementation of a form between mentor and mentee (this might be already available at the local institutional level) to establish goals and methods to achieve objectives, which would be co-signed at the beginning of the academic year (or calendar year) and reviewed every 6–12 months. Such committees might be very helpful as they are for career development grants.

We also have some suggestions to the mentee: Be mindful of the mentor's time (eg, by being prepared), but

never be reticent in approaching your mentor; if needed, you might need to change mentors; and, remember you will be soon a mentor yourself!

In summary, mentorship is a vibrant and fulfilling experience that affords limitless opportunities, not only for the mentee but also for the mentor. We hope that our commentary might serve as a “guide” or “primer” as well as a forum to stimulate discussion and customization about the issues outlined and beyond.

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## Conflicts of interest

The authors disclose no conflicts.

## “What Color Is My Parachute”: Career Opportunities in Academic Gastroenterology and Hepatology

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Two roads diverged  
in a yellow wood,  
and sorry I could  
not travel both . . . ,  
. . . looked down one  
as long as I could,  
then took the other,  
as just as fair.  
The Road Not Taken,  
Robert Frost,  
1874–1963

**M**ajor changes are underway in the demography of the health care en-

vironment; consequently, career opportunities in academic medicine are also changing. It is therefore difficult to know which direction the wind will blow. On the one hand, there are significant decreases in reimbursement rates and cost concerns that are flattening hospital and practice margins, thus limiting the ability of organizations to expand. At the same time, so-called accountable care organizations (ACOs) are forming that seek economies of scale in the delivery of health care.<sup>1</sup> Although the exact form of ACOs is a work in process, it can be imagined that career opportunities in academic medicine are not only going to change as a consequence, but also expand as institutions coalesce into regional behemoths that are likely to far exceed the size of traditional academic medical centers (ie, the era of the integrated health care system). In considering the road that the health care environment will take and the effect on career opportunities, the demographic data may already be supportive of the latter possibility. Specifically, for the first time, the number of physicians affiliated with organized health care systems (~55%) exceeds the number of individuals in private practice (~45%); at the same time, the overall pool of physicians is increasing. If this is the case, it might be anticipated that the range of career opportunities will increase as accomplishing the core missions of the academic medical center (teaching, patient care, and research) in the ACO era will increasingly widen to include those needs associated with the “business of medicine.” In so doing, the changes afoot can be imagined to have many effects. They are likely to be drivers of specialization that, in a business sense, may create delivery and

cost efficiencies. It can also be imagined that the needs of the organization will expand and, at the level of the individual, more and more careers will have multiple concurrent facets and even different types of emphasis during the course of an entire career. This commentary seeks to provide some guidance, not only in the career opportunities that are currently prevalent, but those career types that might be envisioned to increase over the coming years.

### “Where Do I Want to Hang My Stethoscope?” Career Opportunities in Patient Care

The core function of an academic medical center is related to patient care. This patient-centric view guides everything that we as academicians subsequently do as part of our unique mission: Education, research, or financial decisions, and consequently is a fitting place to begin this commentary. “Common things are common” and academic medical centers are no different. This is often captured in the case mix index (CMI), a measure of the complexity of the medical problems that are cared for in a given clinical setting, be it academic medical center or community hospital, and captures the broad clinical challenge that most regional medical centers and their affiliated hospitals must confront. In gastroenterology, a colonoscopy performed at a hospital associated with an academic medical center is little different than a colonoscopy performed at a non-teaching hospital in the community, for example, highlighting the broad clinical mandate of an academic institution. Hospitals associated with academic medical centers are, however, quite different than nonacademic institutions in terms of the diverse complexity of the patients cared for as well as the range of teaching and research programs with which they are affiliated. Although financial matters are often among the first questions that may be asked of oneself during this decision-making process, it is equally important to ask the question, “What type of environment would I like to work in the most?” Numerous organizational behavior studies have confirmed the importance of nonfinancial



metrics as being just as central to job satisfaction as is financial reward.<sup>2</sup> Therefore, this is a very personal judgment making any decision just as valid as another.

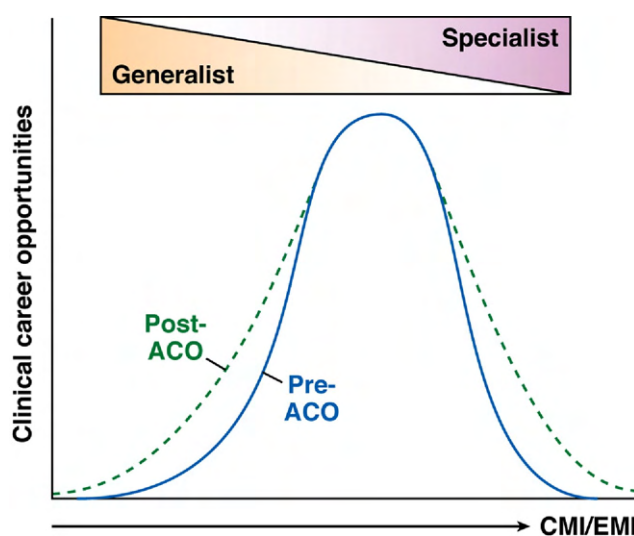
Academic medical centers are exciting, vibrant environments that provide a wide variety of clinically focused career opportunities. Moreover, these career paths are layered and largely reflect different levels of specialization. Because a defining feature of an academic medical center is its unique role in education and the fact that all clinically oriented faculty members spend on average 10%–20% of their time in direct and indirect supervision of trainees at all levels, the practitioner in the academic environment is often called a “clinician-educator.” The clinician-educator in an academic medical center can take many forms, largely depending on their degree of specialization. Thus clinician-educators range from those who function as generalists, whose practice has a CMI that is little different than someone in private practice to individuals who are highly specialized within the broad disciplines of gastroenterology, hepatology, and endoscopy. The most common forms that subspecialization assumes are “IBD-ologists,” pancreatologists, esophagologists, “motilists,” interventionalists, and hepatologists. There are even higher specialized distillations of clinical practices that may focus on tiers within the given subspecialties, such as transplant hepatology, endoluminal surgery, or even a focus on a specific disease, such as is the case for inflammatory bowel disease. This increasing tendency to specialize is a form of academic evolution as clinician-educators in the academic milieu tend to focus on problems of increasing complexity, often as a natural process associated with the requirements of the promotion process but perhaps just more based on the human instinct to excel.

In the era of the ACO, it can be envisioned that there will be a tendency to spread the curve of expertise (Figure 1). On the one hand it can be imagined that there will be ever increasing demands for specialization as quality measures are often linked with the numbers of patients in a given category that physicians care for. Such data largely come from the surgical literature, with very few data in the gastroenterology literature. However, studies in endoscopy support the notion that numbers of procedures performed such as endoscopic retrograde cholangiopancreatography are directly linked with the outcomes and ultimately quality. As technology further creeps into clinical care and more specialized procedures become introduced into clinical practice, such as translation of molecular concepts into clinical care in clinical genetics and advanced endoscopic procedures such as balloon enteroscopy or confocal endomicroscopy, for example, it can be imagined that the rate and range of specialization will increase. On the other hand, it can be anticipated that in the era of the ACO, with the amalga-

mation of increasingly more facilities together with many different layers of complexity, academic environments will be clinically more diverse as physicians from the community are brought into the sphere of the academic environment and morph from pure practitioners to clinician-educators. As such, the demand for individuals who function at the cusp between nearly a pure clinical care function and the types of clinical work and supervision associated with the clinician-educator will increase. Taken together, the number of patient care career opportunities for trainees coming out of teaching programs is likely to be significant as academic centers seek a broad array of clinical skills within their armamentarium.

## Education in an Academic Medical Center: “Everyone Is Doing It!”

There are students everywhere in an academic medical center and it can be imagined that this will be more so in the era of the ACO. As with patient care opportunities, there is a theoretical educational mix index (EMI) that characterizes the career experience of this sector within an academic medical center. There are clinician-educators who participate in the education of trainees (medical students, residents, fellows, as well as paraprofessionals including physician extenders) in the general practice of gastroenterology who might be considered low EMI educators. In this metric, specialty-oriented clinician-educators might be considered high EMI educators. This concept is consistent with the advanced levels of education that are required for advanced training in disciplines such as interventional endoscopy, oncology, genetics, transplant hepatology, motility, or in-



**Figure 1.** Clinical and educational career opportunities in the ACO era. In the era of ACOs, it is anticipated there will be a broadening of clinical and educational career opportunities associated with the ACO mandate as these academic medical centers expand largely by acquisition and consolidation. CMI, case mix index; EMI, educational mix index.

inflammatory bowel disease, for example. Regardless, education of young people is thus perhaps the most clearly distinguishing trait of the academic environment.

As in patient care, the art of education has experienced a similar degree of specialization. The concept of evidence-based educational approaches have increasingly been considered and applied to the educational experience at all levels of the student population including medical students, residents, fellows as well as post graduate medical education. Moreover, and consistent with this trend, the professional organizations that oversee credentialing of educational programs have demanded this. Increasingly, divisions of gastroenterology, hepatology and associated endoscopy centers, as well as departments of medicine, around the country have not only been instituting the concepts of master clinicians in departments that are often financially supported by philanthropic means, but specific career paths are beginning to evolve with education as a central focus, including commensurate pathways for academic promotion. These include career paths that are directed to the role as program directors who manage fellowship training in gastroenterology and hepatology. A faculty member must be 5 years post-fellowship before formally and permanently assuming this role and is clearly a laudable career path to which one can aspire. In addition, as education increasingly evolves from art into science, there are numerous opportunities for advanced training and consequently trainers who are involved in educational activities. Given the complexities that exist in health care organizations and the delivery that is necessary to achieve high-quality, cost-effective, evidence-based care in the ACO era, education, educational programs, and educators are undoubtedly going to be an increasingly important part of the fabric of academic medical centers.

## **“What Will Tomorrow Bring?” Career Opportunities in Research**

Despite the constraints that exist in current research funding, this is in fact a very auspicious time to be devoting oneself to a research career. Technologies that enhance the capability of interrogating fundamental, translational, clinical, and population-based scientific questions are truly marvelous and groundbreaking. Such an environment allows students and fellows in their training, and established faculty members, to discover molecular mechanisms of disease and concepts of patient care delivery in ways that can profoundly influence health care. As a clinical or basic investigator, the opportunity to take the career path that is “less travelled” and consequently see the world in a truly unique manner provides fulfillment and exciting paths that can be primarily provided in an academic context. Research opportunities in

an industry setting are not covered here, but will be a future topic of this section.

The career opportunities in research, perhaps more than any other opportunity in academic medicine, require extraordinary focus and specialization. Moreover, the research directions that can be taken largely reflect the various types of translational medicine. As we increasingly focus on the opportunities provided to human health by research, it is important to consider the career opportunities in translational medicine. There are 5 basic types of translational medicine, each reflecting the various translational (T) hurdles that need to be overcome in moving from a fundamental idea to a cost-effective deliverable that benefits human health as recently reviewed by Westfall et al.<sup>3</sup> The first is T0 research, which is centered on basic and applied mechanisms of disease that ultimately focus on identification of molecular pathways and consequently a lead molecule or methodology for treating a human disorder. The second is T1 research, which focuses on the development of new methods of diagnosis, treatment, or prevention of disease. T1 research is classically characterized as first-in-man (phase I) and phase II clinical trials. T2 research is the research associated with the application of clinical studies in order to translate specific therapeutics, tools or approaches to individual patients (phase III clinical studies) compared with T3 research (phase IV) clinical studies, which aim to implement and translate the research to the overall practice of medicine so that the delivery of care is directed at the “correct patient and at the correct time.”<sup>3</sup> In more recent years, the notion of T4 research, often called outcomes research, is of particular interest in the ACO era because it focuses on establishing the true benefit of a therapeutic approach to the health system. Such research is often called comparative effectiveness research and focuses on issues of quality, effectiveness, and cost in health care delivery.<sup>4</sup>

## **Training for the Future**

The purpose of fellowship training is to mentor the development of an investigative focus in any one of these aspects of the translational process. As such, the concept of a physician-scientist has morphed into one of a physician investigator who is committed to any one of these components of the translational “value-added” chain and highlights the increasing importance of interdisciplinary activities that involve basic, applied, and various types of clinical investigators. Such a flattening of the relative importance of one or another type of investigator is an earmark of modern academic divisions of gastroenterology and hepatology. The message, therefore, for trainees is to focus on a specific topic and acquire a unique set of quantitative skills that will allow one to excel and discover the aspects of life and life’s workings

as they apply to health care. Such a notion will allow an individual in the proper mentored environment to make themselves competitive for a position in an academic medical center and in the increasing numbers of opportunities that have arisen in the overall health care sector, including the biotechnology, pharmaceutical, and business communities. As a final note in this area, it can also be imagined that the “tissue interfaces” between various layers of the health care delivery and service system will continue to blur, resulting in a softening of the interface between the academic, health care administration, and pharmaceutical sectors. Thus, the skill sets necessary for success in one will be very similar to those that are required for success in the others.

## Final Thoughts

Academic medicine is in a period of enormous change that is similar to the degree of change experienced in the early 1990s during a previous period of health care reform. As observed by Campbell,<sup>5</sup> confronting these challenges will require increased focus on strategic business-making decisions, increased interactions between clinicians, educators, and investigators in the academic community as well as interactions with industry, together with an expanding need to consider new ways to accomplish our core missions (patient care, education, and research). The ACO movement may be a natural consequence of these events and a means to manage these various strategic challenges. As discussed, this leads us to a notion that there will be an expansion of the career opportunities in academic medical centers. Although seemingly confusing or worrisome at first glance, given the financial constraints that are evident, the health care sector still represents >15% of the gross domestic product of our country.<sup>6</sup> It is thus our view that this is a time of great opportunity for individual development and more so for an increasing bandwidth of talents to be involved in the system of academic medicine.

Despite this optimism, there are some cautionary notes. We remain hopeful that, in the end, academic institutions will make the correct decisions so that the full opportunity for the individual trainee is revealed.

Many dangers exist in the authors' view, including the potential for a tectonic, balkanized separation of the various specialized enterprises associated with education, research, and patient care that categorize the integrated academic health care system. However, despite this cautionary note, it is our view that the future is bright for the individual trainee. As a final note, although our comments have focused on trends within the United States, it is clear that similar changes are occurring in a related manner internationally. In the end, there are many choices for a trainee to make for them to find job satisfaction. But when pondering these, please consider the closing words of Robert Frost; “I took the one less traveled by, / And that has made all the difference.”

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The authors disclose no conflicts.



## Trains, Tracks, and Promotion in an Academic Medical Center

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Academic medical centers (AMC) are defined as communities of students, physicians-in-training, clinicians, and scientists engaged in higher education, patient care, and research. AMCs typically reside within universities comprising other fields of study and

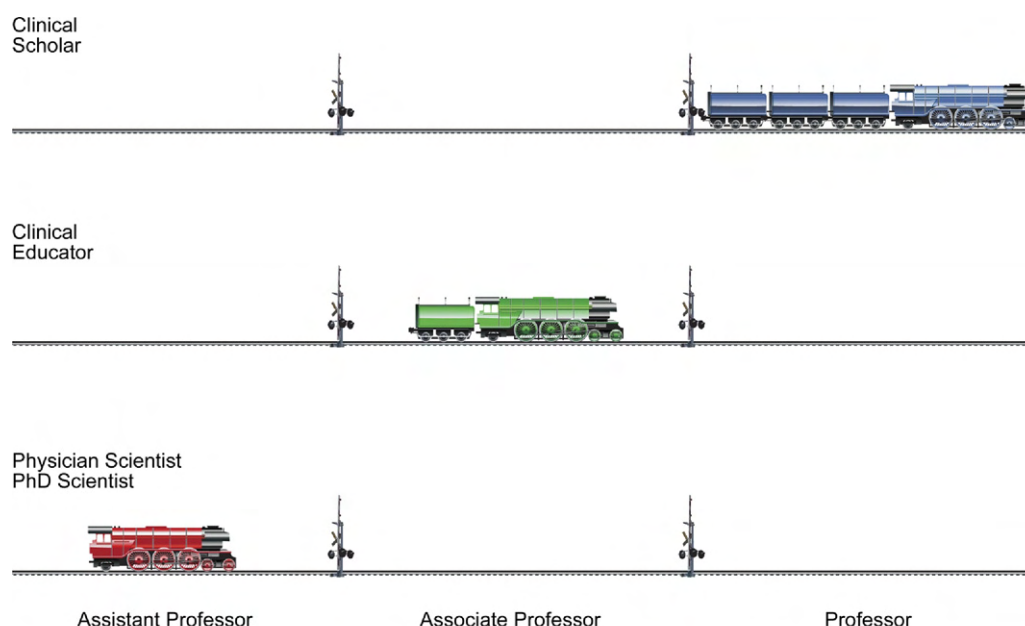
multiple colleges (eg, college of engineering, arts and sciences, business). However, an AMC may stand alone as a health system (eg, Mount Sinai, New York, and The Mayo Clinic Minnesota), or as a health science center comprising only colleges associated with health care plus a hospital (eg, University of Texas Health Science Centers). Within these AMC complexes reside the college of medicine and its associated hospital. The college of medicine, an important and an integral part of these academic institutions, is charged with improving public health, a process that requires excellence in education, patient care, and research.<sup>1</sup> The success of medical schools is based on the quality and achievements of the faculty and the environment provided by the institution to maximize the potential for success of its faculty.<sup>2</sup> Indeed, the human capital of the medical school is its most precious resource and is to be developed, recruited, retained, and hopefully cherished.

Because the goals of the medical school are multifaceted, yet intertwined within the larger institution, most medical schools offer multiple job descriptions to achieve research, educational, and clinical excellence. The job description is associated with expectations, responsibilities, and accountability, and is referred to as a “track.” The names and numbers of the institutional tracks vary among AMCs, but commonly include clinician-scholar, clinician-educator, and physician-scientist. Clinical scholars largely excel in clinical care. Clinician-educators are expected to provide clinical care and contribute heavily to medical education. Physician-scientists/PhD scientists conduct basic, translational, or clinical research and are expected to make substantive contributions in the areas of scholarly pursuit. Another commonly used model is the tenure and the nontenure track system, with the

tenure being the “traditional” instructional track, which includes the physician-scientist, the PhD scientist, and the clinician-scholar, with scholarship/investigator initiated research being the predominant component of the job. The nontenure track predominantly includes the clinician-educator track. To retain the best and brightest faculty members, medical schools in the context of the larger institution employ a series of review criteria to assess faculty performance. Success is defined as promotion through the academic ranks. It needs to be emphasized that criteria for advancement vary among different AMCs and it is essential for the faculty member to be well familiar with the local track expectations.

Within each track, there is an academic rank; academic ranks in an escalating order includes assistant professor, associate professor, and full professor (Figure 1). Promotion from an assistant to an associate professor marks a key transition in the academic life cycle. This promotion signifies academic accomplishments and “value” to the college of medicine. Failure to obtain this promotion within a specified time frame (the academic clock) conveys the opposite message and may even result in dismissal from the institution. On the other hand, obtaining this promotion often provides a sense of long-term commitment to the individual by the AMC, a position referred to as *tenure*. Although the meaning of tenure is changing (it once indicated a position for life to preserve academic freedom), it is still considered by some AMCs as an important component of career advancement and recognition. Sometimes faculty members are appointed to the faculty as lecturers or instructors, positions that do not involve activation of the tenure clock. This position allows newly appointed faculty members to secure extramural sponsored research funding and to generate an appropriate number of peer-reviewed publications before the beginning of the tenure clock. The academic clock is usually 6–10 years for an assistant professor to make the promotion to associate professor.<sup>3</sup> In some but not all AMCs, the time period can be interrupted for maternity leave, and other family leave absences. To avoid a difficult request by the individual many visionary AMCs now automatically extend the “clock” for such leaves.





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**Figure 1.** Trains, tracks, and academic promotions. Three career tracks are depicted, including the clinical scholar, the clinical–educator, and the physician–scientist. The faculty member is represented as a train engine and the evidence of his or her academic productivity and accomplishments as boxcars being pulled by the engine. A railway crossing alert is at the intersection of the sequential promotion categories.

Academic promotions require the approval of a specific review committee appointed by the institution at large. This Academic Promotions Committee (APC) is the final arbiter of the promotion and has as a goal standardization of promotion criteria across all colleges within its jurisdiction. Given the profound differences between the composition and goals of the various colleges, in many instances, a review group within a specific college renders a decision regarding the applicant's accomplishments and qualifications for promotion before the application package is submitted to the APC. Some institutions have Appointments and Promotions Committees at several levels including the division, department, school, and then university before ultimate approval by the provost and regents of the institution.

Although a merit-based review of faculty continues to be an important factor for academic promotion and success of the medical school, the new complex reality in which today's medical schools operate makes this a challenging and stressful process for the faculty. Many faculty members share parental responsibilities and are burdened by significant educational loans. For this reason, many junior faculty members seek sufficient flexibility in their work schedules and adequate financial compensation to manage both their professional and personal responsibilities.<sup>4</sup> A dramatic drop in the funding of medical research, together with decreased clinical revenues, has created a difficult environment for the achievement of academic success and for the fulfillment of career

goals. Although we acknowledge these issues, they have been adequately discussed elsewhere.<sup>4</sup> In this commentary, we seek to demystify the promotion process, and hopefully provide practical guidance for new assistant professors seeking the enormous benefits and success of an academic career.

## Paving the Way to a Successful Promotion

### *The First 5 Years on Faculty*

**Years 1–3.** This is the time to establish a firm base upon which to build your academic career. In your new faculty position, you are expected to “produce” and the expectations of exactly what you “produce” (ie, extramurally sponsored research funding, manuscripts, practice income) are based on your academic track. Ensuring that you know which academic track you are on and what are the specific requirements of that track is essential for your promotion and academic success. You should also consider selecting a “career mentor.” This individual is someone who can help you to triage the numerous invitations that you will now receive as a new faculty member. Although such invitations are flattering, the time devoted to these activities detracts from your “productivity” in other areas and a career mentor can help you to decide which invitations to accept and which to reject. For those individuals engaged in research, this is the period to obtain funding, generate original data, and

publish manuscripts. Finally, it is vital that you keep track of all clinical and educational activities and update your curriculum vitae (CV) frequently so that all your accomplishments are recorded. In academic medicine with research tracks, you are who you are largely on paper.

Near the end of the third year, it is time to formally evaluate your progress on your academic track. It is essential to update your CV; it is useful to perform a quick self-evaluation. You should review the requirements of your academic track and determine whether the proportion of your time devoted to research, education, and clinical service activities is in alignment with your track. If you find that your distribution of effort and academic track are not in alignment, now is the time to speak with your career mentor and division chief on how to best remedy this situation. If you are satisfied with your distribution of effort, then perform a self-evaluation of your productivity. You should take into consideration funding, publications, and recognition by others in the field of your professional accomplishments. Annually, you should meet with your division chief to obtain to his or her impression of your progress on your academic track.

**Years 4–5 on Faculty.** It is critical that you review the requirements of your academic track again and evaluate your progress. It is essential that your academic track be in alignment with what you are actually doing. If you realize that you are not on the correct track, then you and your division chief should determine how to better meet the objectives of the track, or even change your track. The difficulty in switching tracks differs between AMCs and can be complex in some centers.

**Promotion Package.** Once your department chair, division chief, and colleagues agree that you are ready for promotion, you will need to prepare the promotion package. It is crucial that you check your institution's deadline for package submission. In some cases, there may be divisional or departmental committees that "pre-review" your package before it even goes to the APC. Even though the promotion package is submitted to the APC by the department chair, your involvement in compiling the major elements of the package is helpful and usually necessary. In general, the package includes your CV, a summary of your main achievements in the areas of research, education, and clinical service, and your key manuscripts.<sup>3</sup> A list of references is also included; the APC contacts them directly.<sup>3</sup> In most institutions, it is prohibited or frowned upon for you to contact the listed referees directly. Within this formal promotion packet, it is important to note that institutional "citizenship" and national recognition are strongly considered by the APC. "Citizenship" refers not only to your participation on institutional committees, but also to your ability to work

as a "team player." Examples of being a "team player" include participating in medical student teaching activities or willingness to cover for an ill colleague. Being known as the individual who "helps out in a pinch" goes a long way in demonstrating citizenship. National recognition is essential for promotion to associate and full professor, and requires testimony to this fact in the extramural letters from the references described above.

**APC.** In general, the APC tends to be quite large and includes diverse faculty members. Its members are usually full professors and are familiar with the workings of the institution.<sup>3</sup> The promotion package maybe reviewed in detail by all committee members or by 1 or 2 members who then present the application to the group. Once a decision has been finalized, the outcome is conveyed to the department chair and subsequently to the candidate. The duration of the review process by the APC varies, but usually takes several months.

## Perspective of the Division Chair/Chief

The division chair/chief has a dual accountability. He or she is responsible to the institution and the membership of the division. The division chair's/chief's job description is diverse and includes responsibility for finances, excellence, and quality in clinical care, a successful divisional research portfolio, mentoring and career development, and institutional citizenship. If human resources are the most important capital of an AMC, the division chair/chief is most accountable for the faculty they recruit and retain. The division chair/chief in accordance recruits for "chemistry" and "competence" in all of the tracks. Chemistry defines integrity, a penchant for team work, and professionalism. Competence from a tract perspective is defined by the institution! In this regard, your division chair/chief is, in part, your compass and ally in achieving the metrics defined by the institutional tract.

Division chairs/chiefs pride themselves on the success of their faculty, and their legacy is the faculty they recruit, retain, and help to promote. Although often generational issues may seem to separate division chairs/chiefs from junior faculty, most divisional chairs/chiefs are quite mindful of these differences when providing support and guidance to the faculty members. The division chair/chief is committed to their faculty and wants to facilitate their success. The division chair/chief, however, is the initial arbiter of the promotion process. Their support is essential for submission of the application.

If the divisional chair/chief is both arbiter and advocate of your promotion, what can you and should you expect from this individual? The division chair/chief is there to meet with you frequently, clarify the tracks, and provide information regarding institutional expectations. The division chair/chief should assist in obtaining insti-

tutional resources, define the individual's time allocation, bestow guidance on how you use this time, and remind the individual of institutional time lines. When meeting with the chair/chief, it is optimal if the faculty member has a checklist of items to discuss regarding promotion expectations. Such a list includes, but is not limited to, an assessment of sponsored research funding, publications, national/international visibility, development of a clinical niche, clinical productivity (for MD or MD/PhD faculty who see patients), teaching assignments, current full-time equivalent allocation, and divisional and institutional citizenship. Preparation of a teaching portfolio containing evaluations in addition to assignments is often an important part of the packet. This is especially true for the clinician-educator.

Mentorship, albeit poorly quantified, is widely thought of as being essential for success in academics.<sup>5</sup> Not only should the division chair/chief provide mentorship regarding the academic promotion process, but they should help to ensure the faculty is receiving specific mentorship for all facets of their professional career development. Although mentorship regarding research projects is essential for academic success other forms for mentorship regarding teaching, clinical practice, and life issues are also critical in academia. The division chair/chief should help to select proper mentors for junior faculty, and take responsibility for creating a culture of mentorship. The division chair/chief is also available to mediate mentee-mentorship conflicts, which may arise over a variety of issues.

Success in academia requires resources of time, money, and space. It is, in part, the responsibility of the division chair/chief to help junior faculty to navigate institutional processes to obtain these resources. These resources should be commensurate with the expectations of the track. The division chair/chief, however, is also a steward of limited resources and must be equitable in their distribution. Resources given need to be sufficient to get the job done, but cannot be excessive.

What if one starts off in 1 track, but is not meeting the expectations of the track? As a fellow asked one of us, what is my alternative if there is limited hope for generating significant data, unlikely hope of publishing scholarly work, and limited hope for funding? First one should avoid being in such a desperate scenario, by developing an early roadmap for success! Nonetheless, occasionally an individual may not meet the expectations of a given track. It is the responsibility of the division chair/chief in concert with the faculty member to help redirect the individual's career and,

in essence, consider changing tracks. Many successful academicians have changed tracks and have had extremely successful and satisfying careers in a track different from the one originally selected. Such processes should not be viewed as failures but rather a better realignment of talents and interests.

In conclusion, the promotion process should not be intimidating. Career mentorship plus guidance by the division chair/chief are essential for success. This process can be likened to a train engine on a railroad track (Figure 1). Along the way, the faculty member symbolized by the train engine picks up tangible evidence of her or his academic productivity—the “boxcars.” The cargo within the boxcars for each of the tracks varies between tracks, and will be discussed in future commentaries in this series. When a sufficient cargo has been acquired, the train is allowed to go across the train crossings, representing the academic promotion. The rewards of a successful career are enormous and will be covered in a separate commentary. A sense of altruism in educating future generations of physicians and scientists, practicing tertiary care medicine, travel, making discoveries, establishing a national and international network of friends and colleagues, and a feeling of accomplishment are among the many joys that define academic medicine.

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## Conflicts of interest

The authors disclose no conflicts.

## NIH Early Career Funding Opportunities

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The National Institutes of Health (NIH), within the US Department of Health and Human Services, is the largest source of biomedical research support in the world.<sup>1</sup> The NIH is composed of 27 Institutes and Centers (ICs), each with a

specific mission reflected, at least partially, in its name. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) supports basic, clinical, and behavioral research, research training, and public outreach in the fields of gastroenterology and hepatology, as well as in most other internal medicine subspecialties, including endocrinology and nephrology.<sup>2</sup> Each NIH IC has its own menu of grant types for which applications are accepted. Choosing the appropriate type of grant for which to apply is critical when embarking on a research career.

### Categories of NIH Grants

#### *For Early Research Training*

A Ruth L. Kirschstein National Research Service Award is, for many, their first exposure to NIH funding. Predoctoral students and postdoctoral fellows may be supported by an institutional training grant, which provides stipends as well as an institutional allowance, inclusive of health insurance, for individuals selected by the training grant director. In 2010, NIH Institutional training grants (T-series awards) supported >9500 predoctoral students and >6700 postdoctoral fellows.<sup>3</sup> An additional 434 MD/PhD students, 1307 PhD students, and 1490 postdoctoral fellows were supported by individual F-series awards (F30 for combined degree students, F31 for PhD students, and F32 for postdoctoral fellows<sup>3</sup>). For F-awards, the student or fellow is the principal investigator (PI) of the application that undergoes the usual NIH peer review process.<sup>4</sup> Only US citizens or permanent residents may receive National Research Service Award support, which encompasses both the T-series and F-series

of awards. Funding is limited to 3 years for postdoctoral and 5 or 6 years for predoctoral students.<sup>5</sup> Postdoctoral fellows, but not predoctoral students, incur a payback obligation as a result of accepting this funding. Simply put, the first year of postdoctoral support, whether on an institutional training grant or an individual fellowship, must be “paid back” by performing a second year of research, or the equivalent.<sup>6</sup> Because most individuals remain in a postdoctoral position for several years, this is not difficult.

#### *For Transitioning to an Independent Career*

For early career investigators, namely, those individuals within about 5 years of either obtaining their PhD or equivalent degree, or of completing their clinical training, most NIH Institutes use Research Career Development Awards, commonly referred to as “K-awards.” In 2010, the NIH issued >4000 K-awards; the NIDDK was responsible for >500 of them.<sup>7</sup> The purpose of a K-award is to protect the time necessary for engaging in research and for gaining scientific expertise while moving toward independence. By doing so, the NIH hopes to maintain a strong, well-trained biomedical workforce that can focus on the causes and prevention of diseases, as well as on the health of our population. For all but the K99/R00 (see below), individuals must be US citizens or permanent residents of the United States before receiving, not applying for, a K-award. The research and career development activities must be performed, for the most part, in the United States. K-awards are typically awarded for 3–5 years and are not renewable. The research proposed in the application, as well as all other activities, must therefore be reasonable for a 3- to 5-year period.

Components of a K-award application include not only a strong research strategy, but also a career development plan, a mentoring plan, and commitments from both the institution and the mentor. Tangible demonstration of institutional support, such as the mentor’s time, use of institutional core facilities, access to needed equipment, and, in most cases, salary support for that portion of the applicant’s salary not supplied by the K-award<sup>8</sup> are all considered part of institutional commitment. Letters of recommendation, submitted separately by the referees,



must reflect their familiarity with the applicant and attest to his or her aptitude for, and commitment to, a research career. It is useful to keep in mind the instructions given to reviewers when writing a K-award application.<sup>9</sup>

The major K-award types, used by most ICs, include the Mentored Clinical Scientist Research Career Development Award (K08), which is appropriate for physicians or other clinically trained scientists pursuing a career in either basic or clinical research. Animal, cell, or tissue culture, and purely bench or epidemiologic research is supported by K08s as are projects involving identifiable human tissues. Patient-oriented research, defined as requiring direct interaction between the investigator and the study subjects, is supported by the Mentored Patient-Oriented Research Career Development Award (K23). The K23 program began in 1999 in response to the perception that little translational or purely clinical research was being supported by K08s. K23s require the research project to involve direct patient contact on the part of the applicant. Most ICs require that K08 and K23 applicants be licensed to practice medicine, not just hold an MD, or equivalent, degree. In 2010, nearly equal numbers of K08 and K23 applications were received and awarded across the NIH.<sup>7</sup>

The Pathway to Independence Award (K99/R00) is aimed at postdoctoral fellows with <5 years of research experience at the postgraduate level who are poised for an independent faculty position within 1–2 years. This award is unique among the Ks because US citizenship or permanent resident status is not required. K99/R00 applicants may not already hold a tenure track, or equivalent, position and must be working at a US institution. The application must include an initial mentored research experience, with career development plans, as well as a subsequent independent phase of research. Most ICs support a 1- to 2-year period of K99 support, followed by a 2- to 3-year R00 period. Transition from the K99 to the R00 is not automatic. The K99 awardee must submit his or her offer letter for an assistant professorship, or equivalent, position to the IC that is supporting the K99 as well as a report documenting that the work and career development activities proposed in the K-period have been accomplished.

Each type of K-award, National Research Service Award award, and most other NIH grant types is described fully in a Parent Funding Opportunity Announcement (parent FOA) that serves to define it.<sup>10</sup> It is very important to determine if the NIH IC most aligned with the proposed research supports the type of K-award for which the application is intended.<sup>8</sup> Contacting staff at any relevant institute is strongly encouraged and a list of program staff is included in each FOA.

In addition to the parent FOAs, some Institutes issue their own FOAs for K-awards.<sup>11</sup> An example of this is the

NIDDK Mentored Research Scientist Development Award (K01), which offers PhD-trained scientists the same opportunity for a mentored transition to independence as the K08 and K23 for physician-scientists.

Even though the majority of K-awards target early career development, several are aimed at more advanced career stages. The Mid-career Patient-oriented Investigator Career Development Award (K24), allows a clinical investigator, usually at the Associate Professor level, to obtain 25%–50% salary support\* to pursue their already funded, ongoing, patient-oriented research projects and provide mentoring for the next generation of clinical investigators. Most NIH Institutes participate in this program. The Independent Scientist Award (K02), used in various ways by several institutes, is another award aimed at independent, usually already funded, investigators to support their active research careers.<sup>8</sup>

## ***For Newly Independent Investigators***

While at the instructor, assistant professor, or equivalent position, it is time to submit an application for more substantial, independent funding. The Research Project Grant (R01) is usually most appropriate. Anyone who has not been the PI for an R01, or for another significant grant from either the NIH or any source, is considered a new investigator. A significant grant would be one with direct costs >\$150,000 per year for ≥3 years. NIH Exploratory Awards (R21) and Small Grants (R03) are not considered significant awards.<sup>12,13</sup> Within the new investigator category, Early Stage Investigators are given special consideration by all NIH Institutes. An Early Stage Investigator is defined as someone within 10 years of either completing their advanced degree or, for physician-scientists, completing their clinical training.<sup>14</sup> Therefore, while still supported by a K-award, or shortly thereafter, K-awardees are strongly encouraged to apply for an R01. Should the application be funded, the current NIH policy is that the time committed to research on the combination of the K and R01 must remain at 9 calendar months (75% effort), but that the K-effort can be as little as 50%. This allows leeway in planning the best use of resources and maximizing the impact of the grants.<sup>15</sup> Other types of grant support, or other options for R01-support, such as applying as a co-investigator or as 1 of the PIs on a multiple-PI R01, are also options.<sup>14</sup>

## **Additional Opportunities**

### ***NIH Loan Repayment Programs***

In recognition of the financial burden often associated with earning an advanced degree and of the need to maintain a strong, diverse research workforce that includes physician-scientists, the NIH supports several loan repayment programs (LRPs), the largest of which are the LRP for Clinical Investigators and the LRP for Pedi-

atric Research.<sup>16</sup> Others are the LRPs for Health Disparities Research, Clinical Research for Individuals from Disadvantaged Backgrounds, and Contraception and Infertility Research. The latter is funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development; the former 2 programs by the National Center on Minority Health and Health Disparities. By applying during the once-a-year application period from September to mid November, applicants who can devote 20 hours a week to an appropriate research project for a period of 2 years and who owe >20% of their yearly salary as educational debt, can qualify for up to \$70,000 in debt repayment as well as payment of taxes on that amount. In 2010, The NIH received 3217 new and renewal applications for these 5 programs and funded 1594 of them for an overall success rate of 49%.<sup>17</sup> Because the LRP does not provide any direct funding for research or research training, it is important to clearly specify in an LRP application the source of the funding that will allow the research to proceed and support the stipend or the salary of the applicant.

## ***Resources from the NIDDK***

The NIDDK provides several unique resources for early career investigators. All NIDDK-funded K-awardees are eligible to apply for a small research project grant (R03) during the latter years of their award as an opportunity to gain grant writing experience, receive feedback on their research, and demonstrate their ability to compete for independent funding. K-awardees who have successfully competed for an R01 grant, however, may not subsequently apply for this type of R03. Additionally, every 2 years, NIDDK sponsors a workshop on the NIH campus for DK-supported K-awardees aimed at providing an inside view of the NIH and the peer-review process as well as career advice and grant writing tips from senior scientists who have been successful in obtaining NIH support for many years. Finally, even after successfully competing for an R01 grant, the NIDDK recognizes the need for ongoing support and advice so sponsors a networking and information workshop designed to help with the critical first renewal of an R01.

## **Before Submitting an Application**

To be successful in obtaining NIH funding, start thinking about, organizing, and writing your application  $\geq 6$  months before the receipt date for which you are aiming.<sup>18</sup> Identify appropriate mentors, generate your own preliminary data, hone your specific aims, and heed the advice of your mentors and scientific experts. These are all hallmarks of a successful applicant. Even then, funding is contingent upon more than just a score; funds must be available and each institute has their own policies to govern their funding decisions.

Contact relevant NIH staff early in the process to confirm, first, that your research fits within the mission of the Institute to which you think your application should be assigned and, second, that you are eligible for the award for which you are applying. Because not all ICs support all types of K-awards, it is important that your research and background align with a specific Institute's expectations and requirements.

When submitting an application, include a cover letter to indicate the Institute(s) to which you believe your application is most relevant, bearing in mind that the Center for Scientific Review Referral Officers follow guidelines agreed upon by all ICs and will not assign applications inappropriately.<sup>19</sup> This is why prior consultation with program staff is critical. Applications that cannot be assigned to an Institute are returned without review. Be sure to view the uploaded version of your application to verify that it is correct. NIH policy is that no changes should be made after the submission deadline has passed.<sup>20</sup> Approaches to grant writing and tips from experts will be the subject of future articles in this section of GASTROENTEROLOGY.

## **Final Points**

Because the NIH is not a static institution, but one that is always updating, clarifying, and adding policies and opportunities for funding, it is important to keep abreast of those changes. Subscribers to the *NIH Guide for Grants and Contracts* ListServe, which is open to everyone, are notified weekly of new Notices and Funding Opportunity Announcements.<sup>21</sup> The guide is also searchable so there is no reason to miss out on any opportunity for funding.

A successful research career requires proper training, perseverance, and hard work. Very few investigators are awarded every grant for which they apply. Most investigators combine NIH funding with private foundation, other federal or state, and local, internal support to fund their research. You should also participate in the process: initially as an applicant and then, importantly, as a mentor. When asked to serve as a reviewer, do not pass up the opportunity to become engaged in the peer review process. Finally, remember that the NIH staff are willing and eager to answer questions, help with navigating the NIH system of grants and peer review, and provide advice on what pitfalls to avoid. Do not hesitate to contact us!

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# Mentoring, Education, and Training Corner, *continued*

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<sup>a</sup>Within the NIH salary cap as defined each year in a Notice in the *NIH Guide for Grants and Contracts*.<sup>21</sup>

## **Reprint requests**

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## **Conflicts of interest**

The author discloses no conflicts.

## Grant Writing: Tips and Pointers From a Personal Perspective

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Progress in the science and practice of medicine requires leveraging financial resources to pursue ideas, achieve new goals, and extend professional objectives. These resources are generally allocated through agencies that function through peer review. The need to

convince a reviewing body, funding agency, or philanthropic foundation that these collective plans merit support is, therefore, a rate-limiting step. Herein I outline perspectives gained over years of writing and reviewing grants, and suggest themes to incorporate and traps to avoid in navigating this process. I focus the discussion on federal grant applications—specifically, independent investigator-initiated (R01) applications—commenting where relevant on mentored-type (K) award applications. The commonalities among these applications serves as a focal point.

### Preparation

One of the great myths of successful academic careers is that grant writing is easy and can be accomplished quickly. Neither is true. If possible, plan to allocate  $\geq 6$  months to the preparation phase, particularly for R applications. Other applications, such as K or training-type awards, also require advanced planning and preparation. Preparatory time allocation is crucial to solidifying and aligning preliminary data and ensuring their seamless integration into the aims. Grant writing requires thoughtful planning and preparation to set in place several key requirements, including publications; verification of resource allocation (important for K applications); having in place letters and collaborative arrangements; and, most important, creating the time to review and refine, organize, and integrate the hypotheses and aims while allowing time for expert colleagues/mentors to read the grant and provide feedback. Of note, some institutions offer to pay reviewers to critique grants before submission, which, if available, is worth taking advantage of. Publications are crucial because they estab-

lish a key confidence metric for reviewers: The ability of the applicant to progress from idea to data to finished product. Publications are also an important indicator of the overall merit of the science as viewed by peers. Another important aspect of preparation, sometimes overlooked, is to read the National Institutes of Health-provided instructions and then assemble a “needs list” in the early stages of preparation.

### Planning and Anticipation

In preparing a grant application, it is helpful to anticipate the questions that reviewers will ask, and to frame the approach with these concerns in mind. There are  $\geq 3$  distinct types of questions that the reviewers ask.

#### *General Questions*

Is there a clearly stated, central hypothesis? Are the hypothesis and its underlying rationale interesting and timely? Will the findings from the proposed studies really advance the field? Are the aims arranged with a logical flow and matched to the preliminary data and approach?

#### *Feasibility Questions*

Can you do what you propose? Do your experiments use state-of-the-art approaches? If you are proposing new and untested approaches, do you have the technical and institutional resources to accomplish the stated goals? Have you enlisted collaborators to assist in the technical and conceptual framework of your proposal? Are the experiments you propose possible to complete with the reagents (such as animals or cell lines) in hand? Are these experiments feasible in the time frame you propose? For clinical research proposals, do you have access to the populations and patient material you propose?

#### *Questions Predominantly for Junior Investigators*

Does the applicant have strong mentorship in place? What is the applicant's past performance and recent productivity? Are the studies feasible within the



# Mentoring, Education, and Training Corner, *continued*

time frame proposed? If completed as outlined, will these studies build on an independent trajectory?

## **Core Questions**

**Impact.** Impact is a major determinant of the overall score of an application and it is helpful to solicit perspective from senior colleagues or mentors to align the goals and aims of the application. Will the aims, if accomplished as outlined, have a sustained and important influence on the field? Will the findings advance knowledge of the pathogenesis, treatment or prevention of disease?

**Significance.** It is worth committing several lines of text to summarize the significance of the application. This material could be placed in a brief section either as an introduction to the background or between the background and approach sections. Why are the questions important and how do they address problems relevant to disease prevention, pathogenesis, treatment or outcomes?

**Hypothesis.** This is the primary driver. It is important to identify and emphasize an integrative hypothesis in both the abstract and on the specific aims page (see below). This core hypothesis must provide stand-alone rationale that is based on current information and which ideally directly implies overarching significance of the proposal. Following from this, the core hypothesis should be embedded in each of the aims. Each of the aims may have its own distinctive hypothesis, but it is important that the application have a central theme that provides linkage between the aims.

**Preliminary Data.** Is there a compelling foundation of preliminary and/or published data and does it lead the reviewer seamlessly into the aims of the proposal?

**Organization and Flow.** Is there a predictable and linear flow to the proposal? Are the aims linked thematically with thoughtful contingencies and alternative outcomes?

**Environment.** Are the facilities, resources, and mentorship adequate to the tasks proposed? Junior investigators should consider using the biosketch section to emphasize details of institutional resources, collaborative support, and mentorship.

## **Specific Aims**

Simply stated, the specific aims page is the centerpiece of the entire application. This is the road map for reviewers and the specific aims page will be among the most closely scrutinized of the entire application. It is crucial that it be thoughtfully arranged, clearly written, and flawlessly organized. It is also worth noting that its most important beneficiary is not the reviewers, but rather the applicant. This is your template for the next 3–5 years of work. There are no hard and fast rules in organizing the specific aims page, but some general guidelines may help. Key sentences from the specific aims

page can be used as the framework for the abstract, which should capture the essence of the proposal without word-for-word duplication.

## **Provide a Framework**

Begin with a concise statement of general purpose that leads to an overarching hypothesis. This is an opportunity to introduce the significance of your proposal. Use the active voice, as for example, “We will examine signal transduction pathways that lead to pancreatic cancer.” A general figure summarizing the aims and illustrating the overall integration of the application is very helpful. This figure could be placed either within the specific aims page or in the background section.

## **Summarize Key Preliminary/Background Data**

Focus on key observations that inform the current objectives and avoid a comprehensive summary of past accomplishments. Use short declarative sentences, for example, “We have recently found that patients with XX disease show decreased circulating serum levels of yy. In aim 1, I/we will determine how levels of yy influence the outcome and response to treatment.” Organize the specific aims in sequential, numerical format. Each aim should have a self-contained statement that is embedded within a testable hypothesis. Returning to the example above, aim 1 might be phrased, “Determine how the levels of yy predict the outcome and response to treatment in patients with XX?” Avoid framing questions for specific aims to which the answer is either “yes” or “no”; for example, “Are levels of yy predictive of patient outcomes in XX disease?” The yes/no-types of specific aims are by definition descriptive and are not viewed favorably. Provide enough general information about the approaches to be used in each aim so the reviewer understands the general themes and experimental objectives.

## **Keep It Simple**

Are the questions organized in a logical and hierarchical manner? Can you simply and efficiently describe to a colleague who is not an expert in the field what you propose and why it is important? Short, declarative sentences of intent, supported by a brief rationale, work best. Avoid too much experimental detail in the specific aims page. Reviewers focus on the big picture.

## **Background and Significance**

The current space limitations preclude lengthy background descriptions but this is an important component of the application and it is worth understanding both the general and more specific objectives for this section. The general objectives include the following.

- Demonstrating your understanding of the field, recognizing contributions of others:

- Identifying the next, most logical steps for research in the field; and
- Illustrating how your proposal will expand understanding of the field.

The more specific objectives include:

- Relating your preliminary findings to testable hypotheses in the context of the current application;
- Making direct and plausible connections between your most compelling findings and your current aims; and
- Leaving the reviewer with the sense that you have built a proposal whose foundation and goals are seamlessly intertwined and which now represents the next, most logical direction for the field.

## **Approach**

The approach is the meat of the application and reviewers focus attention on the presentation and flow of this section as a primary determinant of the overall impact. Key components to the approach section are the preliminary studies and experimental design and, as in prior sections, there are important objectives to accomplish for each.

### ***Preliminary Studies***

The core objectives include, first, to convince reviewers that your preliminary data lead to testable hypotheses that are reasonable, novel, timely, and interesting. A second set of objectives is to convince the reviewer that all the proposed methods are feasible and ideally in hand. For junior investigators, the preliminary studies section provides an opportunity to establish core competence in the approaches and to verify the feasibility of the aims. A third objective is to link the preliminary findings with the aims, specifically by illustrating how the outcomes from preliminary data will be pursued through a specific aim or subaim. It is important that the preliminary data be presented from the viewpoint of testable implications for the current aims and that the data include alternative interpretations and caveats. Reviewers pay particular attention to the analyses associated with the data sets in addition to the quality and clarity of the data.

### ***Other General Tips***

For fundamental or basic research applications, particularly for new investigators, it is important that all of the aims have at least some preliminary support. For clinical research applications, preliminary data are less critical than providing evidence for the feasibility of the approach and documenting your ability to reach beyond conventional boundaries (ie, division/department) and to

have fully exploited local resources by enlisting complementary support. It is helpful to organize the preliminary data sets around the relevant specific aim. In other words, preliminary findings that inform the approach for aim 1 should be embedded within the text allocated to aim 1. This organizational framework makes it easier for the reviewer to visualize the hypotheses and aims in the context of preliminary findings and anticipated outcomes.

### ***Key Tips for Figures***

Figures are of central importance to the application. An overarching model figure is very helpful and might include pathways and hypotheses for each aim. The figures should use color if possible for impact and ideally should be able to stand alone. The legends should be readable (no smaller than 9-point font) and should detail what the data show rather than summarizing the experimental approaches used. Figure legends for grant applications are distinct in their construction from figure legends in manuscripts. Do not cut and paste from manuscripts. The goal is to demonstrate to the reviewer that you understand how to interpret your own findings and to frame the results with caveats and alternatives that will inform your approach.

### ***Key Tips for Formatting***

Do not overcrowd pages. White space provides visual appeal and is much easier on reviewers. Avoid lengthy paragraphs with dense text. Use identical fonts for both figure legends and text.

### ***Experimental Design***

Organize each aim and subaim exactly as detailed in the specific aims page and abstract. It is very helpful to organize each aim in a templated modular fashion in which the preliminary data that substantiate the rationale are placed adjacent to the relevant aim or subaim.

A useful template to consider is rationale/experimental approach/anticipated results with potential caveats/pitfalls and alternative considerations. Outline new methods/concepts and emphasize innovation and environment. For new investigators, much of the methodologic validation and environmental resources can be emphasized in the expanded biosketch section. Secure letters of support for components of the proposal that you are not an expert in (eg, a pathologist to help read the histopathology of proposed animal models; a biostatistician to aid with computational aspects). Provide a time-line for each aim and, particularly for new investigators, add a sentence outlining possible future directions. Try to achieve balance across all the aims. There is a phenomenon of applicant fatigue in which the first aim occupies 3 or 4 pages, the second aim occupies 2 to 3 pages, and the third aim occupies a single page. Bear in mind that 1 weak aim will sink an application. Try to balance the

space allocation so that all aims are allocated equal attention.

## ***Other Tips and Pointers for the Approach Section***

Use a modular template. This structure is not only appealing to reviewers, but also very useful for applicants. Reviewers rarely have uninterrupted hours to review an entire application and the modular framework provides natural breakpoints. The modular template also provides a guideline for applicants to compose a structured proposal with a thoughtful blend and balance across all the aims.

## ***Discuss Anticipated Outcomes***

Have you provided a thoughtful and linear analysis of the possible outcomes and related these to your a priori hypotheses? Have you verified that the predicted outcomes will advance the field and yield significant impact? Reviewers will try to make these connections. Discuss alternative outcomes: What if your results differ from the predicted outcomes? It is important to detail contingencies for all possible outcomes and to frame these outcomes in a context that emphasizes fluidity of the approaches.

## **Other Considerations and Additional Review Criteria**

There are several additional components to the application that require consideration. Certain of these components are additional review criteria that the reviewers will consider, but none is assigned a numerical score. These include protections for human subjects, vertebrate animal use, statistical considerations, and welfare and biohazards. There are also sections to justify applications from foreign organizations, a section to describe resource sharing (for unique reagents that may be generated in the course of the studies proposed), and a section for justification of joint principal investigator applications in which the oversight and management of the project must be detailed and mechanisms for resolving conflict should be discussed. Finally, there is a section in which the budget should be justified. For modular budgets (applications requesting  $\leq \$250,000$ ) it is helpful for the reviewers to understand how these funds will be allocated (percent effort and months allocated by key personnel and others). For applications requesting more than the modular budget, reviewers expect a detailed accounting of all the categories of expense allocation. Although there

is opportunity to include material in an appendix, reviewers are not obligated to review this material and it is highly recommended that such key information be included in the body of the application. The bibliography is not included in the page limit, but it is recommended that applicants constrain themselves to literature citations that are representative and inclusive without being overwhelming.

## **Introduction to Revised Applications**

There are several important components to the structure and content of the response to prior review. It is helpful to begin by thanking the reviewers for their suggestions and, in a few lines, to summarize the major changes in response to the previous critique. This structure allows you to acknowledge and incorporate the reviewers' comments and to demonstrate that the revised application is now correspondingly improved. It is then helpful to provide a point-by-point response to the major concerns of each reviewer. Be selective. This is an opportunity to emphasize positive changes and to suggest how these now strengthen the application. Summarize new preliminary data and indicate how this strengthens a new specific aim or subaim. Indicate where relevant that these new findings are included in Figure X in the revised application. Because space is precious, I would not recommend placing preliminary data in the introduction section. Do not waste space with a lengthy discussion of material that you have eliminated, particularly in response to the reviewers' suggestions.

## **Useful Tips and Resources**

The Office of Extramural Research (<http://grants.nih.gov/grants/oer.htm>) has many useful suggestions and a regularly updated service with blogs and updates on peer review (<http://nexus.od.nih.gov/all/nexus-by-date>).

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### **Reprint requests**

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## Writing and Publishing Scientific Papers

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Published scientific papers are essential to disseminate research findings, and publications are a measure of academic productivity assessed for promotion and grant application. However, these are not perhaps the most important benefits of writing.

As M. J. Mahoney once commented, “I would urge you to write not because it is a good thing, not because it is nice to see your name in print, but rather because you will really get to know a field only if you contribute to it” (Mahoney MJ, *Psychology of the Scientist* 1979). For most people, writing is an acquired skill, and success requires a continuum of self-discipline, basic rules and habits, and continuing practice. In addition to good writing, publishing in a scientific journal requires good science and a strategic approach that starts from idea generation to manuscript proofing. In this piece, I share with you my take on writing and publishing. The opinions expressed here reflect my experience with the process and represent advice from mentors and colleagues, reading books on writing, and attending a few workshops. Despite the frequent use of the word *should*, as I express my views and suggestions, I acknowledge that others may see things differently.

### Obstacles to Writing

In the typical academic setting, external barriers to writing include: clinical work, teaching responsibilities, committee assignments, and other personal time-occupying responsibilities. Intrinsic barriers to writing include the inability to begin, sustain, or complete a manuscript, which share similar roots with procrastination, perfectionism, or insecurity. The inability to start writing has been described as an internal critic who “speaks in a shrill tone—rational, often pessimistic, alert only to the dangers of the world around us, and therefore to the shortcomings in our work. He or she edits words and thoughts before we have a chance to put them on

paper, and thus creates a blank page panic.” The inability to complete manuscripts manifests in having multiple revisions, repeated analyses, and changes in the focus.

Many strategies have been proposed for overcoming internal barriers to writing and making the best of whatever time is allowed after accounting for external barriers. My favorite ones are developing spontaneous writing and externality.

If you wish to be a writer, then write. Spontaneous writing results when one learns to write without feeling ready or fully in control or awaiting inspiration. This ability also enables deadlines to be met by ramping up activity on short notice. To develop spontaneous writing, consistently devote at least 1 hour per day, control surrounding stimuli, create, and adhere to self-imposed timelines and monitor productivity. Ideally, writing should become a daily routine with a goal of at least 1 hour. Although famous creative writers tend to be “morning writers,” most of us should focus on finding and protecting a consistent time (any time) of the day for writing in a quiet, comfortable place. As many articles and books attest, the distracting influence of the electronic age is a real and present danger. Another approach that works for some is do the writing in boluses (eg, set aside 2–3 afternoons a week), or to set a target date and aim to complete the first draft of a manuscript within a 3- to 7-day timeframe. To maximize productivity during early phases of manuscript writing, pay less attention initially to structure, grammar, and spelling. Most people are better editors than writers and, therefore, generating drafts through a daily writing routine allows efficient progress through self or group editing. Over time, spontaneous writing will result, as evidenced by learning to “write at a gallop that leaves one’s internal critics behind,” as Virginia Woolf so aptly commented.

Unlike grant applications, most manuscripts have no firm external deadlines. The law of delay, which dictates, “That which can be delayed, will be,” should be replaced with the Priority Principle, where “That which can be delayed, need not be.” To do this, make writing contingent on doing a valuable but recurrent daily delayable activity. For example, schedule writing time before recur-



rent activities, such as eating, taking a shower, or going home to have dinner with the family.

Externality is one way of making writing a more social activity; this strategy may work with some personality types. It entails soliciting feedback from colleagues, friends, or co-authors on parts of the manuscript across stages for preparation, in form of comments or critique on writing. It works best with specific requests and short turnover times. Externality is also good for collaborative team building because it requires reciprocation and may generate new ideas. It may also build a sense of audience and develop better anticipation of critiques. An exaggerated form of externality is the formation of writing groups that are built around regular meetings with short-term deadlines (eg, “Playing the game from draft to full paper in 4 weeks”).

## **Some Technical Aspects of Writing a Manuscript**

### ***Overview***

I find it easier to start by assembling all vital study materials, including protocols, final analyses, and references. I begin by constructing tables and figures based on the final analyses, developing an outline with major and minor points in each section, and then start writing the Results section. It is also possible to get a head start and reduce blank-page panic by writing the Methods and, possibly, the Introduction sections first. The stop (for further analysis)-and-go (write a couple more lines) style of writing is inefficient. After completing and proofreading a first draft that is as complete as possible, share it with the main co-authors; revise; read again; and then revise for content first and for fluency, clarity, accuracy, and grace next. On average, I have 5–8 revised versions before the final manuscript and, when working with fellows and junior faculty, an average of 10–12 versions. Some find it helpful to start with an outline of the different sections of the manuscript, including the tables/figures (supplemental or in the body of the manuscript) that will be linked to different subsections.

### ***Authorship***

The number and order of authors should be discussed and agreed upon as early as possible and, at a minimum, the author list should be included on the front page of the first draft. Authors should include only those who made substantive intellectual contributions to the project and who can defend the data and conclusions.<sup>1</sup> Honorary authorship, which is the listing of authors who do not merit the inclusion criteria, is discouraged. This ubiquitous practice, although in many instances a benign tradition, has several downsides that range from low team morale to frank deception.

The choice of the journal is decided by a knowledge of the paper's focus and strengths, and the journal's impact factor and readership. The best potential journal is one with a high impact that is widely read by one's peers. Because authors typically overestimate the value and novelty of their manuscripts, choosing a high-impact journal for the initial submission can be time consuming and disappointing (you also need to be able to afford the nonrefundable \$75 submission fee for GASTROENTEROLOGY). Applying the “who-cares,” as well as the “who should read my paper?” questions may help; so does consulting with senior researchers. After selecting a journal, check the requirements for submission, proceed with electronic submission, and ensure that you receive a notice of receipt. Also, if you do not receive a decision by a journal within 8–10 weeks of submission, it would be helpful to send a polite note inquiring about the status of your manuscript (for some journals, you can track the status of your paper online). This might prompt tardy reviewers or editors to move things along. One potential downside of pushing things is that it might drive the editor to make a rapid decision based on 1 negative review before receiving a second review that could have been favorable and potentially helpful in ultimately helping your paper be accepted for publication.

### ***Sections of the Paper***

A reader who cannot extract the significance of an article from its title is unlikely to read further. The title should be informative and specific to the study and contain key elements that advertise the paper's design, contents or main findings. Non-informative jargon, such as “A Study of . . .” and inquisitive titles (eg, “Is There a Race-Based Difference in . . .?”), should be avoided in lieu of declarative titles.

The Abstract section is best written last when it is easiest to summarize all aspects of the study. Others start with the abstract because they find it helpful to visualize the entire story, after which they re-edit as the drafts of the manuscript mature. After the title, the abstract is often the only part of the manuscript read by most readers. The “Background” should hook the readers to the topic (with the inclusion of a hypothesis if possible), while the “Methods” and “Results” sections of the abstract should provide facts about number of participants (or experimental model), duration of follow-up (or experimental conditions employed), and major findings. The “Conclusions” section of the abstract should answer the study aims presented in the “Background & Aims” section.

The major function of the Background section is to answer the question: Why did this study have to be done? In this section, the writer draws a map of the research area and situates the current paper within this map. It

can roughly be divided into 3 parts that proceed from broad concepts and end in the specific study conducted. The first third is to briefly cover the magnitude and importance of the problem; the second third is to highlight gaps in knowledge without which science cannot progress, emphasizing what is novel and the implications; and the last third should state the study hypothesis and, possibly, a brief synopsis of results. Avoid exaggerating gaps in the literature by neglecting to reference relevant studies or by overly criticizing previous studies. This section should not read like a comprehensive review article, and it is best kept under 2 double-spaced pages (depending on the style of the target journal).

The Methods section of most studies should contain details of the study design, study population, data collection, laboratory methods, and statistical analysis, preferably using these or similar subheadings. This section is the one most thoroughly inspected by reviewers before publication and by a few interested readers after publication. For specific types of studies, there are published helpful guidelines (Table 1) that provide a description of the ideal reporting of methods and results.

The Results section is the heart of a paper. Enough interpretation is provided to lead the reader from one analysis to the next in a logical, story-like progression that addresses the main study question, rather than the chronology of study procedures. The use of subheadings is encouraged. Avoid describing lengthy or extraneous analyses that provide little support for the main theme, explaining the methods, or comparing study findings to the work of others. Each table or figure should be referred to in sequence and indicate the key findings. The text of the results should explain but not replicate information contained in the tables. Unless the manuscript deals with new experimental or analytic concepts that do not lend themselves to regular graphic presentation, it is often possible, by reading through top journals in the field, to find perfect examples of tables and figures that can be adapted rather than recreating lower quality versions of the same thing. Make an attempt to construct “stand-alone” tables and figures by including details of the study sample and methods in the legends.

The Discussion section should provide a critical argument for the study objectives and findings by covering most of the following questions: Why did you start? What did you do? What answer did you get? What is your

finding, evidence, counterevidence; and what does it mean, anyway? In a sequence that is opposite to that of the background section, the discussion starts with the study’s specific findings, expands into weaving the findings into the greater body of literature, and ends with making broad speculations. The rule of “thirds” can also be applied, with the first third for a synopsis of results and the most important or unique findings, the second third to place the findings in the perspective of the literature, and the last third to bring it all together. It is best to avoid sweeping statements that describe the study as “first, only, best”; it is unlikely to be completely true, and it is likely to alienate reviewers and editors. There needs to be a section for the major limitations of the study, their potential impact on interpreting the findings, and ways with which the effect of the limitations was minimized. To end on a positive note, limitations should be followed by strengths. Thought as well as tact are required in explaining differences between the study being presented and previous studies; appropriate terms to explain differences include conflicting, inconsistent, and having limited generalizability, as opposed to flawed, mistaken, or dead wrong.

The Reference list supporting the methods and claims should be generous, up to date, and thorough in acknowledging previous work. References are read by editors and reviewers. Potential reviewers may get identified from the reference list, which is another reason to be respectful of previous work. It is a good practice to check PubMed a few days before you submit your paper to be sure that there have not been any recent publications related to your work (it is better to be acknowledged by you than by the editor or reviewer). Typing references and running the risk of misspelling names should be avoided (mispronouncing my name is enough punishment). Specialized reference software, such as Reference Manager and End Note, can alleviate these issues; at a minimum, however, copy (and paste) from Medline and format appropriately.

## Format

It is essential that the submitted manuscript looks neat and properly formatted. Editors may assume that a messy manuscript reflects a messy study. The manuscript should be double spaced, using 12-point font, and with a minimum of 1-inch margins. The font type and size should be consistent throughout the document. Each new section

**Table 1.** Guidelines on Writing Specific Types of Studies

Initiative	Type of study	Source
CONSORT	Randomized, controlled trials	<a href="http://www.consort-statement.org">http://www.consort-statement.org</a>
STARD	Studies of diagnostic accuracy	<a href="http://www.consort-statement.org/stardstatement.htm">http://www.consort-statement.org/stardstatement.htm</a>
QUOROM	Systematic reviews and meta-analyses	<a href="http://www.consort-statement.org/Initiatives/MOOSE/moose.pdf">http://www.consort-statement.org/Initiatives/MOOSE/moose.pdf</a>
STROBE	Observational studies in epidemiology	<a href="http://www.strobe-statement.org">http://www.strobe-statement.org</a>
MOOSE	Meta-analyses of observational studies in epidemiology	<a href="http://www.consort-statement.org/Initiatives/MOOSE/moose.pdf">http://www.consort-statement.org/Initiatives/MOOSE/moose.pdf</a>

should begin on a new page, and each page should be numbered in the upper right-hand corner (or left, but not both).

## Submission and Review

### Reviewers

Anticipate potential reviewers. These are usually the recognized experts in the content or method of research employed in your project. Reviewers are likely to be authors on papers cited in your manuscript. Most journals allow, and some insist on, author provision of a list of potential reviewers. Ideally, one would like to receive a fair but favorable review. Therefore, suggest reviewers with a relevant track record, especially those who may share similar views. Do not choose reviewers from your family, research group, or institution. It is important to exclude collaborators as suggested reviewers, although a collaborator on a joint manuscript >3–5 years before submission of your paper is acceptable to include. Typically, handling editors do check the list of suggested reviewers to ensure their appropriate expertise and whether they have collaborated with any of the authors. Potential nonreviewers can also be suggested and, based on my recent experience as an associate editor for *GASTROENTEROLOGY*, these requests are generally honored.

### Dealing With the Journal's Response

Receiving an unconditional acceptance is an unusual fate worth documenting and celebrating. On the other hand, irreversible rejections are so common that authors need to get accustomed to them. Try not to take 1-line rejections personally or seriously. Save some of the rejection letters in case you become famous; then, you can insert them as excerpts in your talks. Upon receiving an unqualified editorial rejection (usually described as priority-related rejection), send the same manuscript out the next day to another journal (with electronic submissions you can do that on the same day). If a rejection is accompanied with substantive reviewers' comments, then it is wise to fix the easy and glaring ones, and then send it out to another journal as soon as possible. Idle waiting, a common occurrence after rejection, does very little to improve chances of future acceptance.

To receive a "conditional acceptance" or "rejection with hope" is the most likely "good" editorial response. Avoid a very quick response, because it may be hasty or create an impression of a hasty response. Because most manuscripts with substantial reviews are sent back to the reviewers, the turnaround time in most journals is several weeks and, therefore, there is little to be gained by send-

ing the revised manuscript in 1 day rather than 1 week. The best course of action is to cool down for 1–2 days and then decide and draft responses in 1 week, including planned additional analyses. In the case of seemingly contradictory or numerous requests from reviewers, it is best to carefully examine clues from the editors as to the nature and extent of the revision needed.

Adequate time should be spent making real changes to the manuscript (including carrying out additional analyses or experiments) and taking utmost care in describing and highlighting these changes. Avoid unnecessary arguments when possible, especially about noncore issues or about changes that you already conceded. Thank the editors and reviewers sincerely without being obsequious; they did spend time reviewing your manuscript, and they have not rejected it yet. Appealing editorial decisions consumes a lot of negative energy, annoys editors and reviewers, and is generally futile. If at all needed, then write a polite, brief appeal letter that summarizes the reasons for the appeal. The most common editorial response to an appeal, which usually follows a several-week delay, is an equally polite affirmation of the original decision. The second and arguably worst-case scenario is for the manuscript to be sent to 2 or even 3 new reviewers (thus reducing the likelihood of a unanimous favorable response to single digits!) and then end up being rejected after a several-month delay.

Writing and getting published can be an interesting and fulfilling process of continuing learning and improvement. Both the process and products of writing tend to correlate with the amount of effort invested. If this piece has piqued your interest, then add to your library a couple of books on the methods and style of writing.<sup>2–5</sup>

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### Conflicts of interest

The author discloses no conflicts.



## A Guide for Success as a Clinical Investigator

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There are several titles given to the academic clinical researcher. Clinician-researcher and clinician-scholar are among the few. Typically they describe an individual who spends approximately 50%–75% of his or her time engaged in

clinical research. Clinical research in this context may include, but is not limited to, clinical trials, observational studies, outcomes or health services research, or translational research including development of biorepositories to link clinical findings with genomic, proteomic, or metabolomic research.<sup>1</sup>

The purpose of this article is to outline the components for and products of success as a clinical investigator (Table 1). The components for success include mentorship, formal research training, sufficient protected time, adequate research support, and a collaborative spirit among colleagues. The products for success include publications, presentations, a national reputation, and extramural funding. These products will lead to promotion, a necessary element of academic success. Underlying all of these components is the determination on the part of the clinician-investigator to succeed. Passion for research and the will to succeed will collectively support you through the challenges associated with achieving success and the failures that will inevitably occur along the way. The remainder of this article addresses these component and products as a path to research success (Figure 1).

Mentorship is listed first, because of its importance; often, it is the mentor's role to assist in obtaining the other components. Without appropriate mentorship, there is little likelihood for success.

### Mentoring

Identifying the appropriate mentoring team is essential. It is important to identify those within and outside your institution with expertise in your areas of in-

terest and to meet or communicate with them regularly. If you are somewhat undifferentiated in your interest, it can be helpful to develop a list of areas for which your institution has particular acclaim and for which there are resources for clinical research. For example, if there is a strong health outcomes research component at your institution, this group might serve as a source of mentors and research support. Although your particular interest might not be in outcomes research, there could be individuals among the group that could guide you in clinical investigation and there will be research infrastructure that is critical for success. Given the broad array of clinical interests (content) and types of research (research methods); it is unlikely that 1 individual can fill all of the young clinical researcher's needs. Therefore, a mentoring team can often be most effective. Among the team, the young clinical researcher should identify a content expert, someone with expertise in the clinical area under study, for example, colorectal cancer screening or Barrett's esophagus and a methods expert (someone with expertise in the type of research to be conducted: eg, clinical trials, observational cohorts, data base research, etc). The young researcher should ideally seek to assemble a team within his or her own institution. For the gastroenterologist, it would be ideal to identify content and methods expertise within the GI division, but this may be difficult in certain settings. Although appropriate content expertise can usually be found in GI, methods expertise and research infrastructure may be lacking. Divisions of Internal Medicine or Community and Family Medicine may contain potential experts in research methods. Your division chief and/or department chair will be able to assist in identifying mentors and resources. It is also important to remember that appropriate mentors can be found in departments and divisions that are distinct from the medical center or school of medicine. For the clinician-researcher, appropriate mentors may be located in schools of public health, centers for research in health policy, or business schools. Although it is important to identify at least 1 mentor in your institution, you may need to look outside your institution to nearby or even distant institutions to obtain the needed expertise.

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**Table 1.** Success as a Clinician–Investigator

Components
Mentorship
Formal research training
Protected time
Research support: coordinator, biostatistician
Collaborative spirit: sustained pursuit of goals
Products
Publications
Presentations
National reputation
Extramural funding

A local mentor is important because he or she can advocate to the division chief, the department chair, or even the dean on your behalf. It is critical to have 1 of your mentors fill this role. This person must believe in you, must be convinced that you can achieve your goals and must be willing to take risks for you. It is key that you identify this type of mentor and develop your relationship with him or her early on. As you think about choosing mentors, it is often helpful to think about some of the other components of your professional life. Promotion, tenure, and work–life balance are critical for the young researcher to address. This type of mentorship will assist you in achieving your goals, as well. It is important to remember that a successful mentor–mentee relationship requires your active engagement. You should be proactive, initiating a discussion about the mentor’s expectations, and the time commitment for each of you in this critical relationship. You should also show appreciation for the time and effort that the mentor has put in on your behalf, and you will understand this better as you expand your own role as a mentor. To maintain a successful mentoring relationship, you will need to be accountable and responsible, completing your projects in a timely manner. A mentor is much more likely to go out on a limb for someone who demonstrates that they are committed to their work than an individual whose priorities are elsewhere.<sup>1–5</sup>

Obtaining the appropriate mentoring team should be the highest priority for the young clinical investigator, because without the appropriate mentors, success will be more difficult to achieve and may even be unlikely. Nurturing the mentor–mentee relationship will promote this success.

## Formal Training in Clinical Research

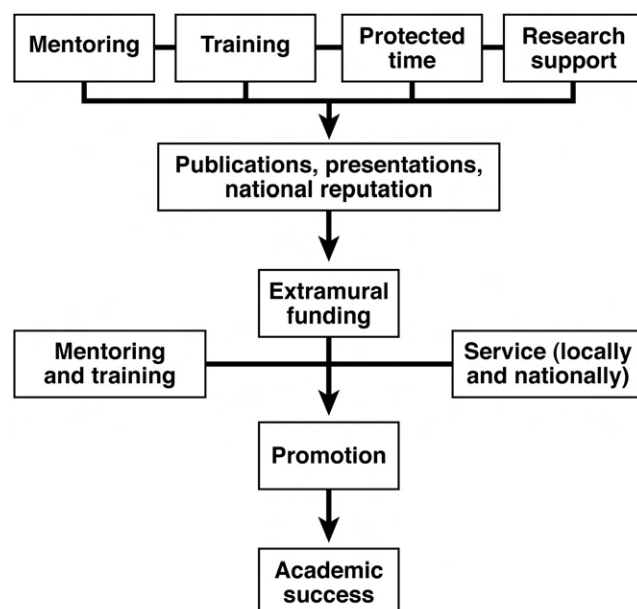
Once the mentoring team is in place, it is time to assemble the other critical components for success in clinical research. The next critical component is clinical research training. I list this second in priority to a mentor, because, in my opinion, it is a key component to a successful, sustainable clinical research career. Just as one would not presume to practice medicine without appro-

priate formal training, for example, medical school and residency, one cannot presume success in clinical research without formal training. Formal training includes coursework in study design, statistics, and research methodology. Ideally, these courses would be part of an educational program that leads to a master’s degree in an appropriate field such as public health, health sciences, or clinical research. The course work is critical for providing the skills needed to conduct the research, and it is likely that your mentor(s) will give you this exact advice. In 2012, with extramural funding for clinical research extremely competitive, the master’s degree confers the credentials needed to successfully compete for limited funding. Remember that the time spent in securing a degree is a huge investment because it helps to build a foundation for something you will be doing for years to come.

Clinical research training may be obtained in several different ways. There may be formal programs through, for example, a K-30 (Clinical Research Curriculum Award) program at your institution, which is a National Institutes of Health (NIH) grant to provide formal coursework for clinical research training. A Clinical and Translational Science Award to your institution might also provide these courses. Other formal training programs can be offered through fellowships at affiliated VA Medical Centers or at nearby schools of public health. Online training might also be an option if you cannot find these programs nearby.

## Protected Time

Once you have assembled your research team and have determined how to obtain the necessary research



**Figure 1.** Components of and products for research success.

training, the next step is to ensure that you have the appropriate protected time to conduct your research and undertake your training. Without protected time, you will not be able to establish and support yourself as a clinical investigator. As mentioned, protected time should be negotiated as part of your recruitment package. The clinical investigator should seek 50%–75% protected time, similar to the bench researcher or research scientist. Protected time needs to be negotiated carefully. Although most clinicians are expected to generate at least a portion of their salary with clinical activities, there is a fine balance here. The clinical investigator should be involved in clinical activities to effectively identify important research questions. However, excessive clinical work precludes research success, so one needs to strike a balance. One argument that has been posed is that as a clinician-investigator, the clinic and the endoscopy units are where you will obtain the subjects for your research. Therefore, the more time spent there, the greater the opportunity to conduct clinical research. Although there is some merit to this approach, embracing it fully will result in spending your time caring for patients, following up on their visits, and leaving little time for much else. Ultimately, this arrangement leads to frustration and is not sustainable. Seventy-five percent protected time may be granted initially, as part of a startup package; however, to sustain this, the clinician investigator needs to obtain grants to support whatever portion of his or her salary is not covered with clinical revenue. Recruitment packages may provide anywhere from 1–5 years of protected time. Then, if the investigator wishes to maintain this level of protected time, this portion of his or her salary must be generated through grants.

Although protected time is essential for the young clinical investigator, it must be used wisely, to obtain research training, develop a project, and obtain preliminary results to obtain the first grant, one that will provide salary support. Effective venues for initial grants that provide salary support include society, foundation and industry junior faculty awards.<sup>6–9</sup> These are typically 1–3 years in duration. They can provide the necessary protected time to complete 1 or 2 projects and obtain preliminary data for career development awards from, for example, the NIH or the VA that will provide up to 5 years of salary support and protected time.<sup>10–12</sup> One way to maximize this time is to develop a Gantt chart, or a timeline of your planned projects, course work, publications, presentations, and grant submissions. It is important to refer to this chart as a roadmap to guide you along the path to success. The Gantt chart is developed with your mentors and should be a reference that is updated for each mentoring meeting.

## Resources

Appropriate mentorship, research training, and protected time form a critical foundation for success in clinical research. The resources to conduct the research are additional essential components. It is important to check at your institution regarding available resources, some of which might not be obvious unless you ask. These resources include blood drawing or specimen collection support, assistance with consent form preparation and approval, and a research assistant or coordinator to assist with data collection and maintaining your projects active during your busy clinical days. This person might also assist in developing databases to maintain your research information. Once the data are collected, they need to be analyzed by an individual with statistical expertise. A statistician is another key member of your research team. Ideally, this person would have been involved in the development of the project, as well as provide critical analysis of the data. Although statisticians are not typically employed by a GI division or even a department of medicine, they can be found in departments of biostatistics, schools of public health, cancer centers, and in centers such as NIH-funded General Clinical Research Center Programs. It may be a challenge to identify a statistician to work with you, but your mentor, division chief, or department chair can assist you in this process. The funds to support a statistician should be negotiated as part of a startup package when seeking your faculty position. There might be additional ways to share a statistician among investigators, departments, or divisions, as well. Typically, formal clinical research training programs for fellows and junior faculty provide statistical support as part of the program.

## Collaboration

Collaboration among your colleagues, another important ingredient, is extremely important if you wish to enroll their patients in your clinical studies. Moreover, their critical appraisal of your study may provide valuable input. Some methods to enhance collaboration include presenting your studies at divisional or departmental research conferences, or, if they do not exist, developing these conferences in which individuals present their studies on a regular basis. Colleagues could be listed as co-authors on your publications, promoting their success, as well. Another effective means for communication is a divisional blog. In our division, we find that our blog is highly successful for disseminating information about our monthly journal club. A blog could be created to list all of the research studies in the division, the principal investigator, coordinator, and inclusion/exclusion criteria. Target recruitment could be listed and updated. Coordinators can recruit for studies using divisional patient

clinic rosters and colleagues can identify studies for which their patients are eligible and refer them.

## Measures of Success

It is worthwhile to consider the products for success, as well. The components that have been discussed provide the means for success. It is essential to use them to develop the products for success, including publications, presentations, and extramural funding. It is these products that are necessary for promotion and a sustained career. With appropriate mentorship, training, and time, you will have the opportunity to develop projects that (with the appropriate research and statistical support) will result in publications and presentations at national meetings. Publications and presentations often lead to invitations to discuss your work outside of your institution and, once you become known for your work, opportunities to serve on national committees. The data generated from your projects will allow you to apply for grants to support your salary and research.

The key components and products outlined in this article are highly integrated and, if approached as a series of steps, carefully documented in a Gantt chart, they will allow you to achieve and maintain academic success.

## Closing Thoughts

Although it would be ideal to have all of the components listed for success in clinical research at the outset of your career, it is often not possible to obtain them, at least initially. There may not be an ideal mentor at your institution, requiring you to seek mentorship elsewhere. Although this is not optimal, long distance mentorship can be effective, particularly with the use of media that allows for face-to-face meetings. Formal research training may be hard to find. One may need to be creative about this, with online courses, short 4- to 6-week courses or other training that can be incorporated into a busy schedule. Protected time is essential. This is something worth bargaining for and worth continued renegotiation. You will not be successful without it. If you cannot achieve the recommended 50%–75% protected time, you might think about other means to increase your flexibility, such as having access to a physician extender. Your goal should be to obtain preliminary

data, publish it, and use it to obtain a junior faculty or career development award as soon as possible to protect your time for research. Research support in the form of a coordinator and statistician can be obtained creatively by partnering with others and contributing to the salary of these individuals. Finally, the clinician–investigator can promote his or her success with a collaborative spirit—a willingness to share resources, assist others, and be a “team player” in the division. Determination and continued pursuit of these components in the face of failures that will occur along the way, and development of academic products, will be the key to sustain you through the challenges you will face. With the will to succeed, you can and will become a successful clinician–investigator.

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## Scholarship in Education: The Currency for Career Development for Clinician-Educators in Gastroenterology and Hepatology

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The clinician-educator (CE) has become a key role in academic medicine and in many academic centers. After a brief review of the history of this career path, this paper focuses on the elements of scholarship central to defining the academic career path of

the CE, including documentation and evaluation of educational scholarship as it pertains to academic advancement on the CE track. We close with a discussion on sources of support for CEs within institutions and at the national level.

### Origins of the CE Career Pathway

Abraham Flexner in his 1910 report catalyzed the transformation of medical education by incorporating scientific principles into medical student education through analytic reasoning and incorporating a clinical phase of training where clinicians, engaged in research, would also teach students scientific principles at the bedside.<sup>1</sup> This change spurred the development of the CE in medicine. For a substantial part of the 1900s, it was possible to fulfill the tripartite mission of patient care, teaching, and research; however, with advances in molecular medicine, physician-scientists needed focused training in laboratory investigation, taking them away from the bedside and prior teaching roles.<sup>2</sup> This shift, along with a growth in demand for patient care and subspecialization, has helped to create a path for the CE. The myriad of clinical diseases, procedural skills, and health care settings in the field of gastroenterology (GI) has created a need for skilled CEs to lead the GI specialty into the 21st century and train the future of our profession.

Most physicians believe a CE is simply a physician who is viewed by trainees as an excellent teacher. However, the CE (clinician scholar, academic educator, teaching scholar, clinician-teacher) as defined by the Association

of American Medical Colleges (AAMC), is a physician whose primary responsibilities are in teaching, patient care or both.<sup>3</sup> These are faculty positions that involve 50%–100% clinical work, interaction, supervision, and teaching of learners; and scholarship.<sup>4</sup> Some academic centers have a separate category for Master Clinicians whose scholarship may lie in developing key clinical programs or who demonstrate a niche clinical expertise. Although there is a wide variation within this definition, there is a continuum from clinician-teacher (mostly clinical with some teaching), CE (clinical, teaching, research, and administration), to educational leader (administration and teaching).<sup>5</sup> There is also a cadre of basic scientists who have transformed their career path to one of a focus on medical education. The nomenclature does not always reflect this type of individual and institutions struggle with valuing and evaluating this role in the academic center. Scholarship in education is one feature that distinguishes the CE from a clinician and clinician-teacher. It is important to recognize that individuals may be compensated for a specific educational role within a medical school, residency program, or hospital; however, to be promoted based on this role or other accomplishments, the individual must participate in scholarly work leading to scholarship. This commentary focuses on educational scholarship for the CE, including how to define, document, evaluate, and support scholarship across the educational continuum.

### Scholarship in Education

Traditionally, academic medicine has defined scholarship as research, peer review of results, and dissemination of new knowledge.<sup>6</sup> The narrow scope of this definition ignores the numerous activities in which CEs engage and does not allow for recognition using traditional metrics for promotion. Scholarship in education goes beyond teaching. Broadly, educational scholarship activities examine (1) the current knowledge in the field and of teaching, (2) invites peer review, and (3) involves the exploration of students' learning.<sup>7</sup> It should be pub-



# Mentoring, Education, and Training Corner, *continued*

**Table 1.** Examples of Educational Scholarship Across the Educational Continuum

	Undergraduate medical education (UME)	Graduate medical education (GME)	Continuing medical education (CME)
Teaching	Preceptor or small group leader in a preclinical course, lecturing in GI pathophysiology course	Ward attending, endoscopy attending, fellows precepting in clinic	Workshop leader for a CME course (hands on endoscopy workshop) Lecture at a CME course
Curriculum development	Problem based learning materials for GI pathophysiology course	Women's Health curriculum for GI fellowship	Post graduate course materials Clinical practice journal club materials
Advising/mentoring	Serving as an advisor to medical students as part of medical school advising committee	Research or career mentor to a fellow in training Developing mentorship sessions for trainees about how to seek effective mentoring	Leading mentoring skill development sessions locally or nationally
Assessment	Abdominal exam skill assessment tool as part of physical diagnosis course Test development for a course	Assessment tools to measure ACGME competencies in fellowship Procedural skills checklists and assessment materials	Knowledge assessment materials for practicing physicians Quality initiative materials for practice improvement
Educational leadership and administration	Course or clerkship leader Medical school dean	GI/hepatology fellowship program director Residency program director	Overseeing CME activities for a local or national professional organization Course director for a CME course

lically available, open to evaluation, and in a form others can build on, which is similar to peer review and scientific development in the basic and clinical sciences.<sup>7,8</sup>

The AAMC Group of Educational Affairs held a consensus conference in 2006 to translate these definitions into concrete categories for educational scholarship, which include teaching, curriculum development, advising/mentoring, learner assessment, and educational leadership/administration.<sup>9</sup> Table 1 provides examples for each category as related to the GI specialty at the undergraduate (UME), graduate (GME), and continuing medical education (CME) levels. This system provides a structure to examine the breadth of a CE's work over a career.

A new challenge facing CE faculty is how to engage in scholarship related to education, because it differs from the clinical or basic sciences. A survey of 263 faculty at a private medical school found that although 60% of faculty were interested in education, only 18% were involved in educational research and 22% did not know what educational research was.<sup>10</sup> These findings may be similar at public schools as well; however, time and effort on activities is closely linked with budgeting priorities and if a school engages in mission-based budgeting with education as part of the mission, more faculty may be aware and engaged in education scholarship.<sup>11</sup> Although research is one option for scholarly activity, the above definition of scholarship captures the variety of options

of CEs' academic work, which can be encouraging to faculty interested in pursuing this career path.

## Documenting Scholarship in Education

Traditional physician-scientists have a clear currency of success, which is understood by others within academia as markers of achievement. These include grants, research publications, and national visibility (eg, service on study sections, membership of journal editorial boards). CEs engage in teaching, leadership, and patient care activities whose impact may not extend beyond the local or regional environment and their success is harder to measure externally.<sup>12</sup> Therefore, a system of documentation for scholarship in education through the educator portfolio (synonymous with dossier, promotion packet, P and T notebook) is being increasingly used to track and measure CEs academic progress.<sup>13</sup> The form, content, and evaluation of these portfolios are currently topics of interest in many academic medical centers.

A 1997 survey of 142 medical schools showed that 73% of schools used a teaching portfolio to assess teaching abilities as part of the promotions process; however, the portfolio's importance lagged behind teaching awards and peer and learner evaluations in the promotions process.<sup>14</sup> A 2004 study showed that 64% (n = 76) of medical schools have web-based information about how to document educational activities for promotion using a port-

# Mentoring, Education, and Training Corner, *continued*

**Table 2.** Most Commonly Cited Section in an Educator's Portfolio<sup>13</sup>

Section	Description
Philosophy of education	A brief statement which outlines the CE's approach to teaching, impact through their work has had on the learning of students and housestaff, and how the work has furthered the mission of the department and institution. A yearly assessment and statement can be useful as an interim step aiding in the creation of a summative statement before a promotions cycle.
Teaching	List of all teaching activities, level of learner, topic, and effort. Cumulative teaching evaluations can be presented.
Advising/mentoring	Name of mentee, purpose of relationship, duration and process, current status of protégée, outcome of relationship and documentation of effectiveness.
Dissemination	Documenting the impact the item had, which could include peer-reviewed articles, number of views or downloads if on a publically available portal or inclusion in other widely distributed material.
Honors/awards/recognition/service	Formal awards, thank you notes, letters and other evidence of excellence for teaching or of an educational product (including regional or national presentations of the work); committee involvement.
Curriculum development/evaluation	Curricular materials, learner and peer evaluations of the material.

folio, which represents a 400% increase from 1992.<sup>13</sup> In a survey of 435 chairpersons in primary care, the use of portfolios seems to be associated with institutions with advanced education programs/academic fellowships. When portfolios were used, 85.5% of respondents stated that there was greater satisfaction with the source of information regarding a faculty candidate in the promotions process.<sup>15</sup> With an increasing interest in the CE academic track, educational portfolios will gain wider acceptance as part of the promotions process.

The portfolio can be a hardcopy or in an electronic document. In preparing a portfolio, some CEs prefer to use a 3-ringed binder in which they place all materials that they would like to include in the final product. The binder can be divided into the 5 sections mentioned for ease of organization. Once it comes time to assemble the portfolio, items can be uniformly formatted into PDF documents or using Microsoft FrontPage and saved to a CD-ROM to be shared electronically.<sup>16</sup>

There is no consensus on the content of the educator's portfolio, and each institution has its own guidelines. Conceptually, there are some common elements: A personal statement about the philosophy of education to provide a context, a detailed listing of teaching/scholarly activities, recognition of excellence (awards, comparative evaluations), course and study (ie, professional development activities) to increase expertise as an educator, and publications.<sup>16,17</sup> Alternatively, the portfolio can be organized into the main areas of scholarship outlined, as suggested by the AAMC.<sup>9</sup> The portfolio should showcase the CEs growth and success, while providing a context and reflective critique of the material for the reader.

Simpson's survey of 16 medical schools where portfolios have been in use since 1992 found the following 6 most commonly included sections in an educational portfolio: Philosophy/personal statement, teaching, ad-

vising/mentoring, dissemination, and honors/awards<sup>13</sup> (Table 2). The portfolio should catalogue not only the specific items created, teaching experiences, and other activities (committee involvement), but should include evidence or a measure of impact. A statement about the philosophy of education provides a context to the reader for how the individual materials come together with an eye toward career development. Educational scholarship can take many forms. Peer-reviewed publications, review articles, curricula, learning tools, and assessments are some of the tangible outputs of a CE. In addition, CEs are involved in work that has less tangible results, such as organizing a conference, leading a weekly tumor board, mentoring/advising, and leadership. Print as well as multimedia products such as videos, websites, and audio files have been included in portfolios.<sup>18</sup> Student and peer evaluations, letters of gratitude from mentees, and summaries of leadership activities can show evidence of the less tangible activities of CEs. Although publication is one vehicle for dissemination, the output of a CE's academic work can be distributed via the web (eg, AAMC's MedEd Portal, a peer-review electronic repository; ACGME best practices website), list serves, and online journals, and should be given space in a portfolio.

A Harvard Medical School study of 15 faculty members' portfolios illustrated the variety of items placed in an educator's portfolio. These included original articles, chapters, syllabi, computer resources, and videotapes, with entries across the UME, GME, and CME continuum. The number of articles increased from assistant professor (3.4) to full professor (42.6), and syllabi were greatest amongst junior faculty. The number of teaching awards was similar across all ranks, whereas external invitations for workshops and lectures increased with rank (from 1.8 to 11.4 invitations).<sup>18</sup> CEs are engaged in several scholarship related activities at any one time. Faculty should continuously update their portfolio, mak-

ing sure it is consistent with institutional guidelines, and gather supporting data to ensure they have captured the breadth and impact of their work.

## Evaluating Scholarship

A challenge for the CE career path has been creating metrics to evaluate products of educational scholarship. Educational scholarship has relied on learner and peer appraisal, which can be subjective.<sup>13</sup> Current, peer-reviewed, medical journals favor quantitative research over narrative/qualitative research and are, at times, lost with how to evaluate social science type research, making these publications unwelcoming spaces for educational research.<sup>19</sup> Recently, the medical educational community has tried to develop guidelines for evaluating scholarship.

After reviewing criteria used by granting and publication agencies in the sciences, Glassick<sup>20</sup> distilled 6 standards, commonly used which can be applied to educational scholarship: Clear goals, adequate preparation (understanding the field), appropriate methods, significant results, effective presentation, and reflective critique.<sup>6,20</sup> Like planning a well-designed clinical trial, these criteria should be used as part of planning or engaging in educational scholarship, not solely for evaluation. In addition the use of Kirkpatrick's model<sup>21</sup> for evaluation can be employed assessing the significant results of any educational endeavor: Satisfaction/reaction of learners, learning (changes in knowledge, skills, attitudes, and/or behaviors) and application (representing desired performance in other settings, and impact, either internally or externally).

In addition to newer electronic and peer-reviewed formats for dissemination of scholarly work, several venues exist to publish medical education research in traditional written formats. To date, there are 45 journals dedicated to medical education,<sup>22</sup> including *Medical Education*, *Academic Medicine* (AAMC), and the *Journal of Graduate Medical Education* (ACGME). Other journals, such as *JAMA*, have a theme issue on medical education, which may be a suitable venue for publication. Many of the major GI journals publish education-related research as it pertains to fellowship assessment, endoscopic teaching, and career development.

The AAMC encourages documentation of both quantity and quality, broadly defined as evidence that activities achieve excellence using comparative measures, when available, as part of a portfolio.<sup>9</sup> Quality is measured in several ways and can include evaluations, measuring outcomes, and summarizing results and comparing them with external standards where appropriate. Quantity should include the number of activities and the number of learners involved. Engagement with the educational community includes drawing on "best practices" from the literature, responding to public comment about the

work, and disseminating scholarship through meetings, workshops, papers, and digital media. Collectively, this can be summarized as Q<sup>2</sup>Engage.<sup>3</sup> An AAMC Task Force is currently developing a toolbox for use by decision makers (eg, those on Promotion and Tenure committees) in the evaluation of medical educators. This product is defining criteria for educator activities and will provide tools to analyze an educator's contribution using a systematic approach to evaluation.

These guidelines can be applied to the promotions and tenure process when evaluating a portfolio. Richards<sup>23</sup> describes the application of an National Institutes of Health-style research review format to evaluate CE portfolios using criteria described for an annual education award. Faculty reviewers showed good internal consistency using the rating tools and noted ease of using established criteria. However, because of the wide variety of expression and form, quality of work was the most challenging to judge. Increasingly, CEs are involved in quality improvement work as part of their clinical and administrative roles. The Institute for Healthcare Improvement's Health Professions Education Collaborative has created promotion guidelines for CEs involved in quality improvement and education.<sup>24</sup>

There is wide institutional variation in the metrics for promotion from assistant to associate professor and then to full professor. In basic and clinical sciences, national and international reputation is a factor in the promotions process. For CEs being considered for associate professorship, a local or regional reputation is accepted as a metric. In general, the quantity and quality of work as well as its impact and dissemination are key factors in evaluating the educational scholarship of a CE in the promotions process.

Although there are similarities between clinical science and educational scholarship, this approach to evaluating CEs contributions needs to be disseminated and adopted by all faculty who are part of the promotions/tenure process and institutions that support CEs and value them.

## Supporting Scholarship

Success in academia is best fostered by superb role modeling and mentoring. Residency programs have developed trainee level CE experiences to foster career development.<sup>25-27</sup> CE-oriented GI fellows may explore resources through medical education fellowships, academies, and institutes of medical education at the local and national level. These experiences incorporate didactics and mentoring with an emphasis on documenting educational scholarship. Opportunities for certificates in medical education, offered through the AAMC or a variety of universities, and a Master's degree in Education, or specifically in Medical Education or Health Sciences Ed-

education, are also options for those with a serious interest in incorporating education as a major focus of their career. Some Master's programs have largely web-based instruction with a requirement to be on site for some portion of the educational experience, usually over the summer, making it possible to continue working while pursuing this advanced degree.

To support the CE in promoting scholarship, many institutions have created academies or institutes that nurture growth in educational scholarship by supporting excellence in teaching, rewarding educational initiatives, and advancing creativity and innovation.<sup>28</sup> There are several different models of these academies, some with open admission for all who apply and some with tiered membership of members, fellows, and masters. A common precept of all of the academies is to provide a "home" for medical educators for faculty development, support, and a forum for collaboration and exchange. Academies may also increase the visibility of the CE within an institutional perspective, lending more clout to this endeavor.

Some institutions have adopted a mission-based budgeting model of supporting faculty in the different roles within the academic missions.<sup>11</sup> Putting dollars directly toward education and, at some institutions, particularly toward teaching, also lends support and credence to the role of the CE. However, faculty must acknowledge that performing an administrative or teaching role may not represent scholarship and it is important for faculty to consider transforming what they do as their hired role into a scholarly activity.

Funding for educational scholarship is limited, and is the rate-limiting step for many CEs to advance their scholarship. There are small and large grants offered through professional societies, foundations (Macy, Hartford, Pew, and Kellogg), and occasionally, the National Institutes of Health, for education related research. Institutions may offer small pilot grants for CEs interested in support scholarship related work.

Finally, national societies may provide support for the CE. At national meetings, faculty may submit abstracts based on their innovations in education or present proposals for workshops or plenary sessions. Poster sessions and other opportunities for showcasing technological innovations may be an option at a national meeting. Most national societies have an Education or Education and Training Committee, where a faculty member can participate in working on projects in education. Some specialty societies are considering Academies within the society for supporting their CE members.<sup>29</sup> In fact, the American Gastroenterological Association will be the first medicine subspecialty society to establish such an academy this spring when the AGA Academy of Educators, which is supported by Pfizer, will be premiered at DDW 2012.<sup>30</sup> This initiative of the AGA will support and help

to promote the CE by recognizing GI and hepatology educators as key members of the academic team and will serve to promote clinical educators through activities and faculty development opportunities that support education, teaching and academic advancement.

## Summary

The CE academic career track has continued to take shape over the last 20 years. CEs and the academic institutions that support them will have to expand their concept of educational scholarship in order place this track within an academic world that has been largely reserved for physician-scientists and clinical investigators. For the gastroenterologist/hepatologist, this expanded view of scholarship should inspire those who teach trainees and practicing clinicians to build upon what is known, measure its effectiveness, and disseminate educational research and products in order to educate a new generation of clinicians.

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## Conflicts of interest

The authors disclose no conflicts.

## Selecting a Fellowship in Gastroenterology

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For the trainee who has decided on a career in gastroenterology, the process leading up to a successful pairing with a fellowship program can seem daunting. An informed and organized approach is important to be successful in the selection of a program.<sup>1</sup>

The process can be conceptualized in five phases: preparation, application, interviews, ranking, and matching (PAIR-Match; Figure 1). In recent years, this process typically involved preparation starting from the first postgraduate year of internal medicine training; however, the internal medicine subspecialty match has recently undergone a shift in its timetable. The process and details of applying for a gastroenterology fellowship have been addressed in a recent MET Corner article.<sup>2</sup>

The selection of a fellowship program actually begins before a candidate even fills out any applications. During this preparatory phase, residents should start by considering their own qualifications, strengths, weaknesses, and limitations that could affect the specific programs for which a candidate should apply. Residents should seek advice from their own program director regarding the number of programs to which the candidate should apply. Because gastroenterology fellowships are currently quite competitive, a candidate may need to apply to a dozen or more programs to ensure an adequate chance for a successful match. After an application is submitted to a program, each program selects trainees to interview. Once the interview process has been completed, both the prospective trainees and the programs rank one another, and the selection process begins.

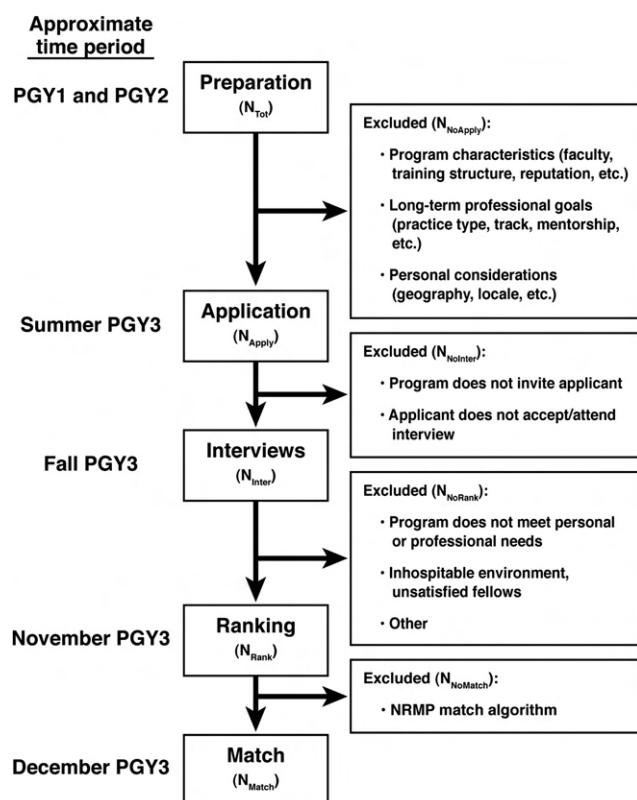
Factors affecting selection of a gastroenterology fellowship program by a trainee and vice versa are not well understood. Studies have focused on other specialties such as surgery, obstetrics and gynecology, emergency medicine, radiology, and internal medicine.<sup>3-7</sup> Even among these widely divergent fields, the factors cited as

significant in their selection of training programs overlap considerably.

Broadly, the important factors involved in the selection of a training program fall into 3 categories: program characteristics, long-term professional goals, and personal considerations. In a survey addressing factors that affected medical students' selection of an internal medicine program, the most important factors were house-staff morale, academic reputation, the variety of clinical experiences, a location near a spouse or significant other, and a positive interview experience.<sup>5</sup> Similar factors have been reported to be important in other fields as well.<sup>3,6,7</sup> Anecdotally, many of these factors seem to be applicable to the selection of a gastroenterology fellowship program, with the addition of some specialty-specific nuances. In this article, we discuss considerations that a prospective gastroenterology trainee may wish to consider in their quest for an appropriate fellowship program.<sup>8</sup>

### Program Characteristics

The Accreditation Council for Graduate Medical Education provides accreditation for gastroenterology training programs in the United States<sup>8</sup> and stipulates the requirements necessary for programs to maintain their accreditation. The Gastroenterology Core Curriculum was created as a joint venture between the 4 major GI societies (American Gastroenterological Association, American College of Gastroenterology, and American Society for Gastrointestinal Endoscopy, American Association for the Study of Liver Diseases) to provide a general framework for training programs that can be tailored to meet the needs of individual trainees based on the strengths of the program.<sup>9</sup> All programs should offer a variety of clinical experiences with adequate training in both inpatient and outpatient settings in a diverse patient population. The programs should similarly provide exposure to specialized training in areas such as motility, advanced endoscopy, and transplant hepatology, but the level of training can vary considerably. Such differences between programs may be important for a trainee with



**Figure 1.** The “PAIR-Match” flow diagram of a successful fellowship selection process by an individual applicant. Successfully selecting and matching into a gastroenterology fellowship takes place in 5 general phases: preparation, application, interviews, ranking, and match. Between each phase, a number of programs may be excluded for various reasons.  $N_{Total}$ , total number of programs available;  $N_{NoApply}$ , programs not applied to;  $N_{Apply}$ , programs applied to;  $N_{NoInter}$ , programs not interviewing applicant;  $N_{Inter}$ , programs interviewing applicant;  $N_{NoRank}$ , programs not ranked by applicant;  $N_{Rank}$ , programs ranked by applicant;  $N_{NoMatch}$ , programs not successfully matching with applicant;  $N_{Match}$ , program successfully matching with applicant; NRMP, National Residency Matching Program; PGY, postgraduate year.

specific long-term interests. Programs should provide opportunities to do electives outside of the division for the trainee to complement the training, such as rotations in surgery, radiology, or pathology. Educational conferences should be frequent enough to provide thorough didactic coverage of gastroenterology and hepatology, but not too burdensome that clinical training and personal satisfaction are compromised.

The local, national, and international reputation of the faculty, the program, and the division can be vitally important to some candidates, especially those who wish to enter a career in academic gastroenterology. For trainees who do not plan on entering academic medicine, such aspects may still play an important role in future practice opportunities. Faculty and programs with a strong local reputation may garner more referrals, and improve the educational experience for the trainee. Interactions with local physicians can allow the trainee to showcase his or

her interpersonal skills, medical knowledge, and patient care abilities. The faculty should also have collegial relationships with closely aligned specialties such as surgery and interventional radiology to allow for collaborative approach to patient care.

Program structures themselves can vary widely and can play a significant role in trainee satisfaction. Patient care should be balanced between endoscopic and nonendoscopic training. An administrative infrastructure that promotes and supports fellowship training without undue economic or service pressure is an important consideration. Program-specific details such as rotation schedules, call responsibilities, trainee salary, book allowances, and travel stipends may be available on program websites or can be requested during the interview, and may be important for certain applicants. Other factors may need further clarification, often through direct contact with past and current trainees. Such factors include ancillary staff support (particularly in the ambulatory setting), depth and breadth of endoscopic experience, elective or research time allowance, possibility to obtain a degree during the fellowship (eg, in clinical design or health research policy), faculty involvement in patient care and trainee education, and board preparation and passage rates.

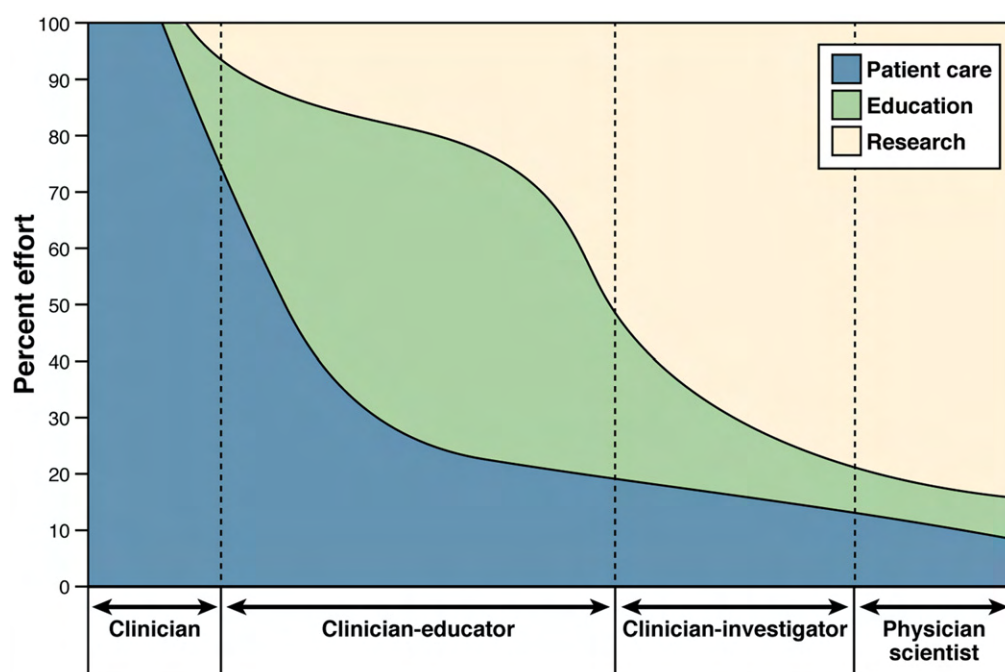
## Long-term Professional Goals

Applicants to fellowship programs should develop an idea of their long-term career goals. Well-defined career goals can help guide residents to apply to appropriate fellowship programs, because some programs may be better suited to certain types of careers than others.

Residents should give significant thought to the eventual practice type they intend to enter. The most simplistic model distinguishes between private practice, health care organization, academic practice, and industry (eg, pharmaceutical companies). However, lines between these silos are increasingly blurring, as academic institutions, health care organizations, and small private practices consolidate more and more.

A second aspect that residents should consider is the percentage of time they anticipate spending in various activities after training is completed. This percentage is usually considered based on the effort (time) a physician dedicates to particular responsibilities, averaged over a week, a month, or a year. Such responsibilities include patient care, teaching, research, and administration. The specific “tracks” (Figure 2) that a physician maintains can vary based on the institution or the practice, and can change over time.<sup>10</sup>

As a resident’s interest to engage in activities other than patient care increases, the more formalized training in these activities the resident should seek out in a fellowship program.<sup>11</sup> For example, if a resident expects to



**Figure 2.** Example of the ranges of percent effort within different academic tracks. An academic physician's time (percent effort) can be generally divided into 3 categories: patient care, education, and research. Although the specific tracks vary from institution to institution, faculty within each track are expected to dedicate a specific proportion of their time to each category.

spend >50% of his or her time dedicated to research after training, then a program with a dedicated emphasis on research during training is more likely to fulfill this goal. The skills needed to achieve success in this path (often called a clinician-investigator) are significantly different from the skills needed to perform patient care exclusively. Although some type of research or scholarly activity is required in every training program, most training programs are geared more toward training the fellow for a career with an emphasis on patient care.

Training programs that are successful at producing clinician-investigators should prepare the fellow by providing a significant block of uninterrupted time ( $\geq 12$ –24 months, depending on prior experience such as a PhD) for learning the skills needed to be an independent researcher.<sup>12</sup> Programs need to provide adequate mentorship opportunities for the trainee by established investigators as well as formal training in research methodologies.<sup>11</sup> Programs should also teach the trainee various administrative skills, such as grant writing, manuscript writing, research presentation, and career development. Programs such as these occasionally offer the option to obtain an additional degree (eg, Masters in Public Health, PhD), although such education often requires additional time.

An additional consideration should be given to subspecialization. Each fellowship program has its own areas of relative strength and weakness. Certain programs may be completely lacking in particular areas, especially with more “niche” areas. If an area of weakness is a medical content area, such as nutrition or motility training, this weakness can often be overcome within a program by

supplementing the education with digital modules, self-directed learning, or specialized training rotations (eg, American Neurogastroenterology and Motility Society's Clinical Training Program, Nestle Nutrition Institute Clinical Nutrition Fellowship Program). However, if the trainee has interest in pursuing this subspecialty in the long term, the inability to foster that fellow's learning experience locally may lead to long-term disappointment with training. On the other hand, some programs have faculty with national or international expertise in particular subspecialties (eg, inflammatory bowel disease or hepatology). Residents applying to fellowship with a well-defined desire to subspecialize in a particular field may wish to seek out programs that can further these interests.

## Personal Considerations

Although applicants place greater significance on professional objectives during selection of a training program,<sup>6</sup> personal fulfillment plays a key role in realizing job satisfaction and vice versa. The factors that can help to achieve personal fulfillment can be challenging to define. Ultimately, the applicant determines what is most important, carefully considering how training at a particular program will impact his or her life. For some, the principal concerns revolve around what would best suit a spouse, significant other, or family. For others, personal and job satisfaction results from financial security. In a survey of GI fellows, the strongest correlates of personal satisfaction included having time for family and friends and not being overworked.<sup>13</sup> These factors defy the con-



ventional model of intense medical training common to the past several decades and may reflect generational differences in priorities.

Residents cite program location as a major factor in personal satisfaction.<sup>14,15</sup> Before even searching for available programs, prospective trainees should define their geographic limitations. Prospective trainees may have to remain in a particular city, state or region for any number of reasons (spouse's job, presence of family nearby, etc).

After broadly taking stock of geographic limitations, prospective trainees should consider the resources of the area surrounding the program, such as the local schools, nightlife, and commerce, as well as the presence of supportive family and friends. These resources may improve a trainee's (and his or her family's) quality of life and can be especially important for trainees who have (or intend to have) a family during fellowship. The stress of finding adequate education, childcare, or a job for one's spouse may affect the family's happiness and in turn increase a fellow's dissatisfaction. If the fellow has plans to have children during fellowship, inquiries should be made about a program's family medical leave policies, as a flexible schedule may reduce educational discrepancies caused by schedule interruption.<sup>16</sup>

Financial stress during training can be a major source of fellow dissatisfaction and personal unhappiness.<sup>13</sup> Financial factors that adversely affect job satisfaction include a lack of dental and vision benefits, a lack of disability insurance coverage, the presence of educational loans, and holding a second job.<sup>13</sup> Compounding these factors, fellow salaries are usually modest and typically not negotiable within an individual program during training. Therefore, the applicant should take these factors, as well as the cost of living in a given city or town, into consideration.

## At the Interview

The interview is the final and most crucial step in program selection. The interview can assist applicants in determining which program will come closest in achieving the resident's career and personal goals. Because of limited time and resources, programs only interview a small percentage of their applicants. An invitation for an interview already suggests that the program has taken a significant interest in the applicant.

The interview process is not designed simply for the program to get a closer look at the applicant; fellowship interviews also allow the applicant to "interview" the program. Visiting a program firsthand allows an applicant to both see the physical space in which he or she will be working as well as determine if the program matches its written description and meets the trainee's needs and interests. Applicants should speak with as many of the program's current fellows as possible to

gauge their satisfaction with the training and the environment, or arrange a later conversation with those who are unavailable. Current fellows can give candid information about the actual accessibility of resources for research (both within the division and at the institution), travel, advanced coursework, and mentorship.

A particularly important part of the interview day is meeting the program director (PD). The PD has the ultimate responsibility for creating and maintaining a structured training program that effectively meets the academic, clinical, and personal needs of the fellows and for ensuring that a program's primary role is education over productivity. Programs should have a director who takes ownership of the entire program and works enthusiastically to improve fellow education, despite challenges facing training programs today, including health care reform, and administrative and financial pressures. The PD can address the availability of additional resources that could complement training and fill gaps in education, mentorship, and career development.<sup>17</sup> The PD should also act as an interface between the fellows and the GI community, and should provide fellows with opportunities to interact with prospective employers. Because the fellowship program is usually the final stage of training, applicants should ask for specific information about the jobs their recent graduates have taken.

Fellowship applicants should also become familiar with departmental faculty as well as their clinical and research interests. This preparation allows the applicant to ask directed questions to facilitate a meaningful interaction and gauge one's ability to relate to the faculty. Collegiality between fellows and faculty was identified as a strong correlate of overall job satisfaction among surveyed fellows.<sup>13</sup>

Preparation regarding faculty interests also provides a platform to evaluate the faculty members as possible mentors. The availability of potential mentors in one's field of interest is important for career development and long-term job satisfaction. Mentoring is an important factor in rates of promotion, publication rates, career satisfaction, and confidence.<sup>18-21</sup> Questions regarding fellows' involvement in publications, membership in professional societies, and attendance of and participation in local and national meetings may help determine the faculty's roles in mentoring and fellow education.

## After the Interview

After an applicant has completed his or her interviews, an applicant should take a few moments to write notes to the PD and faculty who interviewed him or her. These letters can solidify the sentiments about the program and serve to remind the faculty about the individ-

ual candidate. A candidate may communicate his or her interest in the program and vice versa, but a program may not ask an applicant about their rank preferences.<sup>22</sup> If significant uncertainty lingers at the end of the interview process, the applicant may wish to consider returning to a select number of programs for a second look (some programs may help to defray the expenses of a second visit, particularly if they are highly interested in the applicant). After considering all the strengths and limitations of the various programs, the applicant creates the final rank list for submission to the National Residency Matching Program.

## Conclusion

Selecting the most appropriate fellowship program for one's particular situation involves multiple aspects that cannot be dictated. Although certain factors seem to guide many trainees into selecting the best program to suit their needs, only the individual applicant can dictate the most important criteria and values in making this difficult choice. Applicants should consider both short- and long-term issues to optimize the potential for both personal and professional satisfaction with a career in gastroenterology.

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## The Process of Applying for Gastroenterology Fellowship

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In the United States, with rare exception, the credentials required for the allopathic clinical practice of gastroenterology (GI) include the successful completion of a GI fellowship training program (GI fellowship) accredited by the Accreditation

Council for Graduate Medical Education (ACGME). The successful completion of an ACGME-accredited GI fellowship is also required for GI-specialist certification by the American Board of Internal Medicine. Increasingly, both board certification and accredited fellowship training are required to receive and maintain privileges as a practicing gastroenterologist at a health-care facility, and to be paneled as a GI-specialist provider by third-party insurers. The ACGME is currently reviewing and revising program requirements to mandate that all GI fellows in ACGME-accredited GI fellowships must be graduates of an ACGME-accredited internal medicine residency; these trainees may have gone to either allopathic or osteopathic American medical schools or to international medical schools.

### The Application Process

Internal medicine residents apply for GI fellowship positions by enrolling in the Electronic Residency Application Service (ERAS), a program of the Association of American Medical Colleges.<sup>1</sup> ERAS allows the applicant to upload a standardized universal application, letters of recommendation, personal statements, board scores, and other certifications required for their complete application. The applicant may then direct their application to the participating GI training programs, of which 156 are currently listed.<sup>1</sup> The programs access ERAS a short while later, and are then able to download and filter through all the applications that have been directed to them. Applicants and programs also enroll in the National Resident Matching Program/Subspecialty

Matching Services (NRMP/SMS), also referred to as the “Match.” The Match is a highly organized system that allows programs to interview as many applicants as they wish, and allows applicants to carefully consider all the programs at which they have interviewed before making a decision. Subsequently, both applicants and programs submit a confidential rank order list of their choices on a predetermined deadline schedule established by the NRMP, and a computerized algorithm<sup>2</sup> “matches” the applicant to the highest program on their rank order list that has an available position. The system allows for additional complexity, in that the GI program positions are sorted into 4 tracks—(1) basic science research, (2) clinical investigator, (3) research (for those programs which do not distinguish between categories 1 and 2), and (4) clinical; furthermore, applicants and programs can have unfilled positions in 1 of the tracks revert, or change, to another track, most commonly research-track positions reverting to clinical-track positions.<sup>3</sup>

### History and Importance of the Match

Participation in the Match is vital to the health of the profession, the welfare of the applicants, and the long-term strength of the training programs.<sup>4</sup> Fellowships are not simply small residencies. A GI fellow is a board-eligible/certified specialist who has completed the competencies necessary for the independent practice of internal medicine. During clinical GI fellowship training, the primary focus is on the acquisition of additional medical knowledge and experience relevant to the management of digestive and hepatic diseases, as well as achieving a specialized procedural competency in endoscopy. Compared with residency, there are opportunities for much deeper mentoring relationships between attendings and their fellows, owing in part to the smaller number of fellows and the increased amount of time each attending spends with them. In particular, these closer relationships can result in significant career development support, especially within a particular attending’s niche area of focus, whether research or clinical education. Additionally, the different training programs vary in their clinical resources, special patient populations, and at-

tending expertise and interest, leading to trainee opportunities for different areas of focused clinical training beyond the basic GI curriculum. For these reasons, it is essential that the applicants allow the Match to fulfill its primary purpose—to achieve a “best fit” between their professional and personal interests and goals, and their potential training program environment. The Match allows applicants to compete for the widest range of programs, and the programs to compete for the widest range of applicants.<sup>5</sup> With approximately 650 applicants, nearly 400 first-year GI fellowship positions, and 156 different training programs participating, the Match is the most fair and productive way to place residents into these training programs.<sup>6</sup>

To underscore how vitally the Match serves the GI fellowship applicants, we can consider the harsh lessons of the calamitous years in which the GI fellow workforce marketplace operated without the benefit of the Match. From 1986 until 1999, GI fellowship matching was organized through the NRMP/SMS. In 1996, because of an abrupt and marked decline in the size of the applicant pool, fewer and fewer programs participated in the Match, leading to its eventual collapse in 1999. The ensuing free-for-all had 2 powerful effects on the applicants. As the marketplace unraveled, programs competing for top applicants continuously shifted applicant interviews earlier and earlier, until by 2005 these interviews were being conducted at the very beginning of the R-2 year. Applicants had very little opportunity to explore their interests within internal medicine, and little opportunity to prepare well for the application process. The second major impact on the marketplace was the loss of mobility. In the face of competition for applicants, in the absence of a Match process, programs were offering choice applicants “exploding offers,” that were essentially time-limited offers of employment. Excellent applicants had to accept their first offers, or risk not finding a fellowship position elsewhere. They had very little opportunity to explore different programs. As a consequence of this chaos, top applicants were often recruited early by the institutions in which they were training in medical residency.<sup>5</sup> Overall, there was a significant increase in the dissatisfaction of trainees with their choices of training programs.<sup>7</sup>

Fortunately, a task force to address the issue of GI fellowship programs rejoining the Match was convened by the American Gastroenterological Association in 2004,<sup>8</sup> and after thoughtful input from GI division chiefs and program directors, as well as the 4 national GI societies,<sup>1</sup> a consensus was reached in 2005 by joint resolution to reenter the Match,<sup>9,10</sup> which resumed in 2006. Several processes were added and subsequently evolved to help mitigate those forces that might strain the commitment of the GI programs to the Match. A

new, key feature of the Match process has been the 2-week time gap between the required deadline for GI programs to declare their positions quota, and the applicants’ submission of their rank order list. In effect, a program attempting to recruit a candidate outside the mechanism of the Match runs the risk of withdrawing that position without a binding commitment from the applicant, who may subsequently change their mind and choose to remain in the Match. Additionally, rapid communication between programs and early intervention mechanisms have been facilitated by a GI program directors list-serve and GI Program Directors’ Caucus. Ultimately, heightened awareness of the issues among applicants has also enhanced expectations of professional conduct in the recruitment process. Annually, the 4 national GI societies have issued a joint memorandum to GI division chiefs and training directors, reaffirming their commitment to the Match resolution, reiterating the importance of Match participation, and proclaiming the determination of the societies to ensure the success of the Match as the proper course for GI recruitment.

Most recently, an important change to the subspecialty match for internal medicine is the time-line shift for application. Despite the fair and productive recruitment achieved by reentering the Match, the 18-month delay between the application process and the start date of fellowship had intrinsic problems, which left room for improvement. To apply for fellowship so that there is no gap between residency and fellowship training, applicants are forced to plan their electives, letters of recommendation, and research quite early in residency training. As a consequence, many potential applicants felt unprepared for an early commitment. This left nearly 50% of applicants deferring application to their R-3 year, which resulted in an obligatory gap year between their residency and fellowship training programs. Internal medicine program directors have been very concerned about the double jeopardy risks of either applying too early (possibly making a rushed or immature decision, with a weaker application overall) or too late (obligating the trainee to a gap year) during residency training. A task force of the Alliance of Academic Internal Medicine proposed a time-line shift in the fellowship application process to each medical subspecialty. The proposal was supported by the GI Program Directors’ Caucus and consensus support was obtained from the 4 national GI societies. A subsequent task force was convened with representation of each medical subspecialty, the Alliance of Academic Internal Medicine task force, and the NRMP. Consensus was achieved, and a new time-line has been agreed upon (Table 1). Fellowship applicants now commence application at the beginning of their R-3 year, having had their first 2 years of residency to rotate through the different



**Table 1.** Schedule for Positions Beginning July 1, 2013<sup>12,13</sup>

Date	Event
February–April 2012	Programs register for ERAS 2013
July 1, 2012	ERAS opens for applicants
July 15, 2012	ERAS opens for programs
August 1, 2012	NRMP registration opens (programs and applicants)
August–November, 2012	Interviews are conducted
November 7, 2012	Program position quota deadline
November 14, 2012	Rank order list certification deadline
December 5, 2012	Match day
July 1, 2013	Start GI fellowship training

specialties, develop mentoring relationships, pursue research, and obtain meaningful letters of recommendation. They interview in the fall of their R-3 year, and match in December of their R-3 year, a half year before the start date of their fellowship.

## General Advice for Prospective Applicants

Several strategies may help the applicant to optimize the process of applying to a GI fellowship. Most important, they need to consider their target program—in which type of training program environment do they most clearly envision themselves? This requires self-reflection and honesty about the following questions. What career path do they truly intend to follow? Do they want to pursue basic science research, clinical research, clinical education, or purely clinical practice? The applicant should have an understanding of their geographic preferences—will the location meet their personal, family, and professional needs, as well as the needs of their significant other-partners? Would the applicant thrive in a smaller group of trainees or in a larger group?

The Gastroenterology Program Directors' Caucus helped to describe the current landscape of GI fellowship training environments. Through data collected by survey, GI fellowship training programs self-identified the subjective characteristic of their size based on the number of fellows trained per year—30% of programs identify themselves as small, training 1–2 fellows per year, 50% of programs identify themselves as medium-sized, training 3 fellows per year, and 20% of programs identify themselves as big, training  $\geq 4$  fellows per year. With respect to the training mission of these programs, roughly two thirds of the national GI fellowships defined their primary mission as training clinicians, and the remaining one third defined their primary mission as training researchers. Nearly all small programs defined their training mission as clinical, and nearly all big programs defined their training mission as research oriented, with a 2:1 split (clinical/research) among the medium-sized programs.<sup>11</sup> Understanding this landscape can help the applicant to organize program-specific information gleaned

from program websites, and subsequently target their applications toward the group of programs that best fit their personal interests and goals.

Once the applicant has selected their target programs, attention to a few key elements can help to maximize the chance of getting an interview. It is critical that applications are submitted as early as possible, and that they are complete. Once the program directors have reviewed enough files to select an interview pool, they do not continue to check their ERAS mailbox for latecomers and stragglers. Letters of recommendation are very important, and best serve the applicant when they are meaningful. The applicant should have spent significant time engaging with  $\geq 1$  GI faculty in research and/or clinical supervision, who will write 1 of the letters. A warm, sincere, and honest letter from a faculty member who knows the applicant well, which goes into great detail with glowing enthusiasm about the applicant's many attributes, is far more valuable than a perfunctory form letter from a famous figure. Program directors are frequently asked about the value of research in the application. Certainly, a different emphasis is placed on research commensurate with the training mission of the program. However, in both clinical and research-oriented programs, program directors are sensitive to those nuances that convey the effort and ability of the applicant. For example, did the applicant design and complete the project, first-author/coauthor  $\geq 1$  peer-reviewed papers, or present the research at a national meeting? Does the research project dovetail with any special clinical or professional interests of the applicant? Or was the applicant merely doing work on an already established project to be able to list it on their CV? Nonetheless, we do not want to underemphasize the importance of participating in a research effort, whether it leads to first or co-authorship of a manuscript, because residency time demands may make it difficult to take a lead role in a project. Therefore, for trainees who are interested in a research fellowship (be it clinical or bench oriented), it is important to identify a project and mentor(s) early on during residency. In addition, for trainees interested in clinical research, taking a year off to obtain an MS degree in Clinical Design, Epidemiology, Public Health, or Outcome Research can be beneficial in some cases. The downside to doing so can be the cost, although some institutions have mechanisms to help fund such training (eg, an NIH K30 award). Also, several programs offer (or even require) such MS training as part of a clinical research fellowship.

Lastly, it is important for the applicant to recognize that everyone who makes it to the interview was already judged to have the credentials adequate for inclusion at that program. From that point forward, the selection process is fairly subjective, and interpersonal chemistry is

a strong influence. The successfully interviewing applicant conveys energy, confidence, enthusiasm, and a demeanor that is professional, but not somber. The applicant should be prepared to inquire about the breadth and depth of the training, and any program-specific unique training opportunities. The more the applicant already knows about the program's features and strengths, the greater the interest and enthusiasm they are communicating. In turn, applicants should be prepared to answer how and why they see themselves suited to train at that particular institution, how they envision their career path in GI, what strengths set them apart as applicants, and how their life experiences and passions set them apart as individuals. Recognize, however, that underlying all this may be a recruitment agenda specific to that particular program at that particular time. Because of the subjectivity of the entire interviewing process, we frequently counsel residents to apply to enough programs to secure 8–10 interviews. Although GI fellowship positions are competitive, an applicant can maximize their chances of being “matched” by being well-prepared for the application process.

In summary, we encourage trainees to start thinking about whether they would like to pursue GI fellowship training as early as possible. Cultivating a mentoring relationship with a GI faculty member is important for all applicants, and particularly for trainees considering a research career, exploring the opportunities to participate in meaningful research and scholarship as early as possible is recommended. It is recommended that applicants speak with their residency program director, the GI division chief, and the GI fellowship director at their own institution once the applicant knows that GI fellowship is the career path they want to pursue. Registering with ERAS and the NRMP, and deliberately investigating the focus and environment of the different training programs, allows applicants the greatest opportunity to find their best “match” with a GI fellowship.

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The authors disclose no conflicts.

## Private Practice Gastroenterology: Challenges and Opportunities

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It's hard to spend 10 years in training only for the economy to collapse when you get out, still looking at 6 figures in student loans. Most of us that have gone directly into practice feel an impending doom, aware that reimbursements are going to drop and feel like we have to work as hard as we can before this happens. I

went back to full-time work 4 weeks after giving birth to my son. I work hard and try to practice honest, ethical medicine. At the same time, the local ACO is talking about replacing screening colonoscopy with stool cards for all but high-risk patients, and this is terrifying!

—Community Practice Gastroenterologist, recently graduated

Currently, there are 1409 Fellows in 158 United States Gastroenterology Graduate Medical Education training programs with 550 expected to graduate in June.<sup>1</sup> Thirty-one percent are women. A typical GI Fellow is 30–32 years old, married (perhaps with young children), has been earning just over \$50,000 annually and carries school loan obligations that are daunting, sometimes exceeding \$200,000<sup>2</sup> (Nayak RS, Wilson KD. Personal communication [both recent gastroenterology fellowship graduates]). GI fellows are trained in patient care, usually within large academic medical centers with advanced infrastructure that is changing to meet coming healthcare delivery challenges. Although >80% will work in nonacademic settings, few will have prior exposure to the realities of private practice gastroenterology. Leaving a large training center for independent practice can feel like jumping off a cliff into a dark abyss with no lifelines.

It is impossible for those of us with established careers to understand the stresses and uncertainties that trainees face today. These issues are not widely discussed but they are shaping the fundamental characteristics of our specialty. We (John I. Allen [JIA]) began practice when gastroenterology was exploding with new technologies and business opportunities. Upon entering practice, we developed referral networks that were relatively secure from massive payer shifts. We added ancillary services (ambu-

latory surgery centers, infusion, pathology, anesthesia) that routinely generated high 6-figure incomes and we practiced with an autonomy that is now gone.<sup>3</sup>

Today, beginning physicians face the combined pressures of consolidating hospital and payer systems, the threat of narrowed provider networks, price transparency, public scrutiny (see [www.angieslist.com](http://www.angieslist.com)), demand for coordinated care, electronic medical records (EMR), Centers for Medicare and Medicaid Services recovery audit contractors, the unknowns of the Patient Protection and Affordable Care Act, stagnant growth in new technologies, and a national debt that dominates all policy decisions. Regulatory pressures, heretofore unknown, hamper innovation in medicine.<sup>4</sup> The same pressures that make a 60-year-old gastroenterologist contemplate retirement are the pressures that influence the choices, optimism, and future outlook of our youngest partners.

The aim of this commentary is to provide information so that you, as a graduating fellow, can do better than good enough. In the new world of healthcare, there will be winners and losers. This article will help you to understand the national landscape so you can choose wisely. It is written from the perspective of a senior gastroenterologist (JIA) and an early phase clinician from a large integrated delivery network (Rahul S. Nayak [RSN]).

### Background: Putting Several Myths to Rest

There are 3 myths about the future of GI that should be put to rest:

- Colonoscopy will disappear.
- Independent practice is dying.
- Gastroenterology incomes will plummet.

#### Myth #1: Colonoscopy Will Disappear

Consider 2 disparate information sources. First, in 2009, the Lewin Group was commissioned by Olympus Corporation to estimate this country's future needs for gastroenterology with special focus on colonoscopy capacity.<sup>5</sup> The Lewin Group is a well-known healthcare



consulting firm and a wholly owned subsidiary of United Health Group. They estimated that in 2008 there were 10,390 gastroenterologists in active patient care (both adult and pediatric gastroenterology) with a median age of 57 years. By 2020, the number of gastroenterologists is expected to increase to 12,813, leaving the country with 8%–12% fewer than needed to provide endoscopic care for an aging population.

Second, Levin has reported a remarkable increase in colorectal cancer (CRC) screening using a multi-pronged, system-wide, focused effort, based in large part on the use of fecal immunochemical testing as the primary screening modality.<sup>6</sup> With both fecal immunochemical testing and colonoscopy as CRC screening options, the California Kaiser Medical Group increased CRC screening rates in their Medicare population from 41% to 85% between 2005 and 2011. Interestingly, during this period their colonoscopy volumes tripled, demonstrating the potential demand for colonoscopy services as more Americans undergo CRC screening (TR Levin, personal communication). Recent 15-year results from the National Polyp Study will further increase the demand for colonoscopy.<sup>7</sup>

## **Myth #2: Independent GI Practice Is Dying**

Challenges for small medical practices have been well documented.<sup>8</sup> Although many smaller practices have dissolved through retirement or equity sales, the continued financial success of mid- to large-sized, consolidated practices demonstrates that this model, when done correctly, will be viable in the long term.

## **Myth #3: Gastroenterology Income Will Plummet**

Over the next 5 years, practices that rely heavily on colonoscopy volume for revenue and do not have negotiating strength likely will suffer as primary CRC screening approaches change and price-per-procedures decreases. That being said, it should be remembered that Medicare fees for colonoscopy have decreased by half from 1989 to 2011, yet incomes of most practices have risen dramatically through increased efficiency and expansion of practice portfolios.<sup>9</sup> Efficient practices that are able to negotiate attractive fee-for-service rates, have already implemented an EMR, have a clear strategic plan, and can manage value-based reimbursement will do very well.<sup>10</sup>

## **Step One: Prepare for Your Future**

Recently, one of us (RSN) published a step-by-step roadmap for GI fellows who are beginning to seek a position in private practice.<sup>11</sup> This monograph provides gastroenterology trainees a personal checklist for securing a rewarding practice position and describes the pros

and cons of solo, single-specialty, multispecialty, hospital-employed, and academic practices. A companion review from the same clinics issue summarized the national landscape of independent private practice.<sup>9</sup> A recent discussion of academic clinical careers in *Clinical Gastroenterology and Hepatology* by Provenzale provides an excellent comparison of career opportunities.<sup>12</sup>

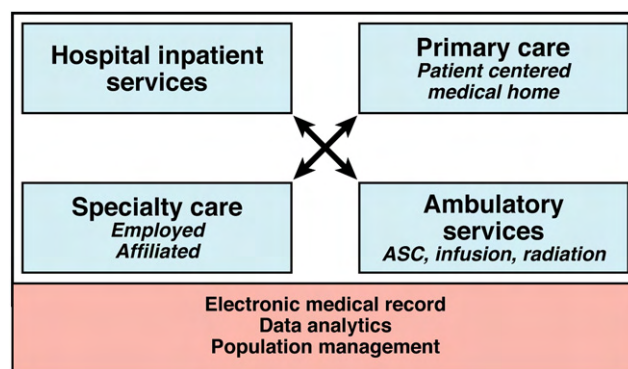
In the process of searching and securing a position, 6 steps can be considered<sup>11</sup>:

1. Set your priorities (location, autonomy, teaching, call burden).
2. Prepare (curriculum vitae, a script for the initial phone call to the practice, introductory letter).
3. Research and network (Internet search, print ads, personal networks).
4. Interview (do's and don'ts).
5. Weigh your options (analyzing a contract, income potential).
6. The first year of practice.

The key take-home message is that careful consideration of your own priorities will help you to find a practice that truly fits, and that this should be a deliberate process.

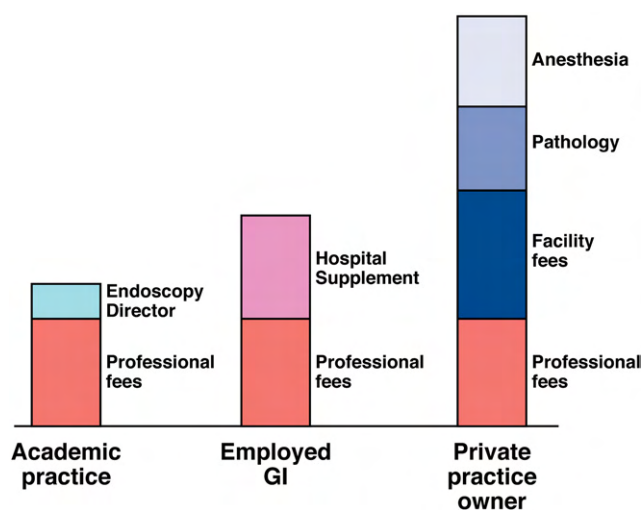
## **Business Models of Gastroenterology**

The options for clinical gastroenterology positions fall into 2 broad categories: Employed or ownership. When all physicians are employed, this implies that someone other than the physician partners owns the practice. The “owner” might be a hospital system, an integrated delivery network (IDN; Figure 1), a foundation, or even a large insurance company. There may or may not be an academic association (medical school



**Figure 1.** Illustration of an integrated delivery network (IDN). IDNs are formed from 4 major components as illustrated in the interconnected boxes. Support for integrated care comes from robust infrastructure as illustrated in the red box. Specialists are often employees of the IDN, but IDNs may also work with independent but affiliated specialty groups. ASC, ambulatory surgical center (a free-standing outpatient unit that often includes endoscopic practice).





**Figure 2.** Source of income. The height of the bars represents the relative income amounts for the 3 most common employment settings for clinical gastroenterologists. The individual contributions to each setting may vary and are drawn to represent one example of relative contributions. Professional fees form the base income for all 3 settings, but income supplements differ depending on practice setting. Employed GI refers to gastroenterologists working within hospital systems or Integrated Delivery Networks (IDN). These physicians' income is often supplemented by hospitals or the IDN to be competitive with private practice.

or graduate training program). Working in an employed position trades some autonomy and upside earning potential for both security and the infrastructure to provide coordination across the spectrum of medical care. Established IDNs are in the best initial position to meet demands of an accountable care organization (ACO). Levin's report<sup>6</sup> demonstrates the potential for improving patient care using the infrastructure of an IDN.

Positions leading to ownership occur within small (<5 physicians), medium (5–19), large (20–39), or “mega” (>40) practices. Choosing a physician-owned, independent practice means both increased risk (vulnerability to referral shifts) and increased earning potential (Figure 2). The majority of independent gastroenterologists are still in small to mid-size groups; however, large single-specialty groups or independent multispecialty groups can be found in all regions of the country. There is increasing consolidation of small to mid-size groups into large groups (currently up to 75 gastroenterologists) to take advantage of economies of scale and group development of pathology, anesthesiology, and infusion services. Mid-size to large groups offer many of the same advantages as the employed model in terms of practice infrastructure, flexibility, reduced call burden, and predictability, while offering access to ancillary income streams and an ownership position.

## Practice Characteristics Important for Years 1–5

Although individual priorities differ, there are some practice characteristics that are critical for success in the early years. It is important to understand that the outcome of either the Supreme Court case involving Patient Protection and Affordable Care Act or the 2012 election will not alter key dynamics that are affecting GI practices. These include (1) consolidation of most sectors in healthcare, (2) purchase of smaller independent practices, (3) increasing overhead from federal and state mandates, (4) a shift from fee-for-service to value-based reimbursement, and (5) dominance of large regional entities (IDN and payers) that can shift referral patterns or exclude practices from provider networks.<sup>9</sup>

For early phase physicians, income (current and potential), practice governance and culture, infrastructure, and the value of the practice to patients and referring sources can determine long-term satisfaction.

## Salary

Beginning salaries vary; as important as the initial salary is, so too are the paths to partnership and opportunities to share ancillary income (which can double the base professional salary). How compensation is structured indicates much about the practice. Practices that pay all partners on a production basis may find it difficult to meet challenges of an ACO or be unable to develop the type of cooperative culture that supports integrated service lines. In addition, if each partner is paid on a production basis and there are differences in payer mixes among partners, group negotiations with some key payers may cause some partners to be severely disadvantaged if the practice rejects a contract from a large payer.

## Culture

The focus on salary often overshadows the key to true practice longevity—culture. Some practices have clearly delineated structures that can include adherence to evidence-based guidelines, clinical research, incorporation of emerging medical devices, subspecialty centers of excellence, and public education activities to name but a few. Other practices are less formally structured and rely on the individual activities of their physicians. Large, highly integrated practices such as Minnesota Gastroenterology or Kaiser Permanente (the practices of the 2 authors) both include structured peer review, performance measurement, and a philosophy of individual physicians working to support the overall mission. In this environment, physician autonomy can be substantially less than more informally structured practices and this environment is not for every newly graduated fellow. Finding a culture that embraces your own philosophy is

# Mentoring, Education, and Training Corner, *continued*

critical; in general, however, practices should be fair to all partners irrespective of age or gender.

## ***Practice Infrastructure***

Key parts of practice infrastructure include a strong management team, fair process communication, and an EMR. The EMR is no longer optional, because it is a key part of healthcare reform and the specific requirements of EMRs are defined under the section entitled “Meaningful Use.” EMR adoption within federal healthcare reform progresses in three stages, each with increasing complexity. Stage 3 of Meaningful Use includes the need for integration of care within regional healthcare systems. A practice with no EMR or a poorly functioning EMR will reduce partners’ income. If a fellow joins a practice that does not have a functioning EMR, they must anticipate significant expense and practice disruption as implementation occurs. A practice should have an EMR and a clear strategy for implementation plus integration with regional healthcare systems and national registries such as the Digestive Health Outcomes Registry developed by the American Gastroenterological Association. This registry forms the foundation of several large-payer quality assessment and incentive programs.

## ***Future Strategy***

Integration across all sites of clinical service, patient-centered care, and an understanding of population management are some hallmarks of successful practice strategies. Strong relationships and involvement in regional ACOs or other horizontal integrative strategies are one approach. Vertical integration and expansion of the breadth of services offered is also a viable strategy.

## ***Demonstrating Value***

Currently, there is unprecedented emphasis on improving transparency in healthcare to provide consumers with actual prices and quality transparency. The goal, according to the Department of Health and Human Services, is to offer “plans that reward consumers who exercise choice based on high quality of care and competitive price for healthcare services.”<sup>13</sup> This represents an opportunity for practices focused on patient-centered, evidence-based care to demonstrate their value. Several large health benefit companies have announced that they will narrow their specialty provider networks in 2012. Aetna, for example, has published methodology for its Aexcl network<sup>14</sup> and purchasers have utilized this system to substantially narrow specialty networks. Again, joining a practice that does not have a keen awareness of payer strategies or a practice that does not have a plan to demonstrate value demanded for top-tier reimburse-

ment may be effectively shut out of large blocks of patients.

## **Conclusion**

Graduating GI fellows face a confusing and ever changing environment in private practice. The good news is that gastroenterology services will see continuing increases in demand and large IDNs continue to place a high value on skilled gastroenterologists. Opportunities in private practice continue to be substantial for practices that have taken time to understand coming healthcare challenges and have invested resources in building needed infrastructure and regional relationships. “Most of us that have gone directly into practice feel an impending doom, aware that reimbursements are going to drop and feel like we have to work as hard as we can before this happens.” There will be changes and there will be challenges, but that has been our reality for decades. The fact is, our incomes will remain in the top 5% of United States workers for years to come. Private practice allows you to work one on one with people who need your skill, compassion, and knowledge. The current and future environment will reward clinicians and practices with a laser focus on improving the lives of their patients and allow those who can demonstrate their value to succeed. The authors of this article do not go to bed at night thinking about profit margins; we reflect on the patients’ lives we have changed each day.

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The authors disclose no conflicts.

## Success as a PhD in Gastroenterology

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It is an exciting time to be a PhD-trained basic scientist with interests in digestive diseases, or the gastrointestinal (GI) system more broadly. This is the time for discovering foundational information about the microbiome and its role in health and disease;

the biology of GI, hepatic, and pancreatic stem cells; the molecular nature of epithelial ion transporters; and mechanisms that regulate food intake, among other exciting areas. All have implications for both GI and extraintestinal disease states. There are corresponding opportunities for physiologists, biochemists, immunologists, microbiologists, and more to contribute to the understanding and development of more effective treatments for disease states such as inflammatory bowel diseases, liver disease, pancreatitis, infectious diarrhea, peptic ulcer disease, and motility disorders. Similarly, there is a wide array of settings in which to pursue such research, ranging from basic science departments through clinical departments to opportunities in the private sector, such as biotech companies as well as big pharma. In this article, however, we focus on the benefits to be gained by a PhD who chooses a pathway in a clinical setting, particularly for those with an interest in translating scientific advances into improvements in patient care.

### Career Options

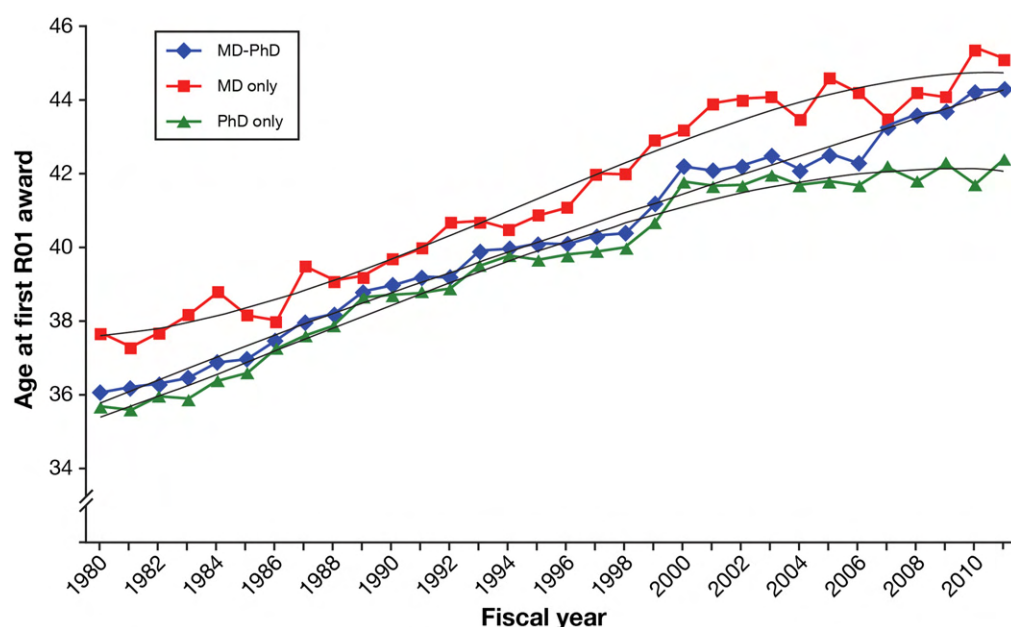
Clinical medicine has become increasingly complicated in recent years, and the ancillary burdens of practice have all but eliminated the classical “triple threat” clinician who is able to excel in teaching, extramurally funded basic research, and patient care. New models for successful career paths for physician-faculty have emerged, with individuals typically choosing to focus on only 2 “legs” of the triple-threat “stool,” such as combining teaching at the bedside with a major commitment to provision of clinical care. The balance has also been shifted because of an expanded set of opportunities

in clinical and translational research for physician scientists. At the same time, the range of mastery needed for a successful career in basic science investigation has increased. There has been an explosion of experimental approaches that can be brought to bear on any given basic research problem, which carries an associated expectation for the development of mechanistic insights for funding and publication success. These latter factors likely have contributed to the fact that the average age for first-time, independent National Institutes of Health (NIH) funding is now in the mid-40s.<sup>1</sup> This unfortunate trend is shown in Figure 1, using data compiled by the NIH. Interestingly, the trends do suggest that PhD investigators may be faring better than those with MD or MD/PhD degrees, providing some incentives for hiring PhD investigators to further an institution’s basic research effort.

Simultaneously in this changing landscape, the NIH and other funding agencies are placing increased emphasis on translation of research findings to patients, which inevitably requires clinically trained investigators. Indeed, there is also a far greater emphasis on team science, with the recognition that the most challenging problems require multidisciplinary solutions. Finally, many medical schools are developing organ- or system-based curricula that eschew traditional basic science courses and, in many cases, shift the burden of overseeing even preclinical teaching to clinical departments, in whole or in part.

All of these trends in academic medicine<sup>2</sup> have opened up new opportunities for the PhD-trained investigator in clinical settings. Traditional gastroenterology divisions in departments of medicine and pediatrics are looking to PhDs to strengthen the divisional research base, generate extramural funding, undertake preclinical teaching, and provide exposure for fellows to state-of-the-art research approaches. Comparable opportunities may also exist in other medical specialties that impinge on the care and treatment of patients with digestive diseases, such as surgery, pathology, and radiology. There are advantages that can accrue to the PhD scientist in this equation. First, an appointment in a clinical division or department may offer the opportunity for a far more in-depth appre-





**Figure 1.** Average age of NIH first-time R01 principal investigators holding an MD, MD/PhD, or PhD during each fiscal year from 1980 to 2011. From the National Institutes of Health.<sup>1</sup>

ciation of one's disease state of interest, which can yield dividends when applying for grant funding. Second, such appointments may allow membership in an institutional digestive diseases center and access to core facilities. Third, access to patient specimens is greatly facilitated, as well as access to different types of trainees, such as GI fellows or surgical residents, some of whom may come with institutional support for their salary. Finally, there is sometimes the potential for greater salary earnings if there is cross-subsidization across divisional missions or access to a different type of salary plan that incentivizes salary amounts drawn from grant resources.

Most of our remarks consider the PhD who is hired as an independent investigator. However, one of the sometimes mentioned downsides of being a PhD in a clinical department is that such positions can often be set up to be only supportive of another (usually MD) faculty member. If you are considering such a position, make sure you discuss expectations and opportunities for you to prove your independence. Without some funds to follow the project of your dreams, and a modicum of time to pursue that project, success may seem an unrealistic goal. Conversely, some projects (eg, discovery research) will reliably spawn new areas of research that can be natural junctions for you to develop your own area. When looking at such a position, it is also important to evaluate how well you can integrate with the academic mission at the university (such as access to graduate students and teaching opportunities) and whether there are mandatory expectations for raising a higher portion of your salary compared with being in a basic science department. Both can impact your advancement. The most important things to consider are your career priorities and goals, then make them fit with the needs of your mentoring faculty member.

## Know and Be Known

The advantages available to any PhD appointed in a clinical department do not automatically accrue. It is critical to be known, by both your basic and clinical colleagues. Academic physicians who are engaged in patient care, even occasionally, have access to an automatic informal network of colleagues built during clinical consultations, which PhDs can only rarely, if ever, break into. This can be somewhat intimidating to a new PhD recruit, and make it tempting to retreat fulltime into one's laboratory and/or to focus one's networking efforts solely on colleagues appointed in basic science departments. Although your basic colleagues are always valuable assets, looking only to them for support and collaboration risks missing out on many opportunities. You need to work at getting to know your clinical peers. As stated, few individual faculty members are contributing equally to the clinical, teaching, and research enterprises, but being unable to contribute to generating clinical income can make a PhD feel like a fish out of water in a clinical department. Do not fall into this trap. Instead, take initiative and develop your understanding of human disease while you get to know your colleagues. Have coffee with the clinicians in your area of scientific interest to find out the things they are perplexed by in their patients, what the emerging trends are in therapy, what they worry about in the talents of their fellows, and so on. This kind of knowledge can pay strong benefits for both your scientific and departmental standing.

For a PhD to capitalize fully on the benefits of an appointment in a clinical department, it is also important to develop a means to contribute to the local environment. One way to become involved is to routinely

attend divisional and departmental faculty meetings. Even if the agenda for these seems heavily tilted toward the nuts and bolts of clinical issues, such meetings offer insights into the challenges your colleagues face in pursuing a clinical academic career. It also helps you to build your clinical vocabulary. This knowledge can help you to navigate collaborations with these clinical colleagues, and hopefully you can also explain the hurdles that pertain to a career path focused on grant writing. You can also learn of new clinical initiatives that may suggest collaborative research opportunities. Faculty meetings also allow you to identify the jobs in the division that are not getting done, such as running the seminar series or teaching the fellows about modern research approaches. If you volunteer to run something, you will gain the appreciation of your division chief, tick the box of university service that may be needed for promotion, and gain increased visibility. Faculty meetings also enable an understanding of the political landscape, which can be useful if you need allies to argue for resources or a new initiative. In a similar vein, make time to attend at least the occasional grand rounds presentation or other clinically focused teaching activity. Often, completely unexpected ideas can emerge when you hear information presented from a new perspective. No matter what, your attendance will be noted and your profile enhanced.

Professional societies represent another important networking opportunity. Although it makes sense to get involved in a national society that caters to scientists in your scientific discipline, you should also consider membership in an organization that addresses the educational, practice, and political concerns of practitioners, such as the AGA and AASLD. All rely on large numbers of volunteer physicians and scientists to staff committees that address a wide range of topics of interest to the PhD, such as lobbying for research funding. You can find a list of the society's committees and their charges by searching on the organization's website. To break into a role on these committees, which will also enhance your profile in other domains, it often pays to be proactive. Committee assignments may be the purview of the incoming president, for example, and a well-timed e-mail that outlines why you are interested in a specific committee, and your qualifications for the position, may often secure a slot. Colleagues are also a useful source of endorsements for committee service and advice about which committees are looking for someone at your experience level. Clinical organizations may also provide research funding to members, a circumstance that is rarer among basic science societies.

## Manage Your Trajectory

Everyone needs to pay attention to the development of their career and advancement of their position,

regardless of whether their primary faculty appointment is in a clinical or basic science department. Unassailable truths are that you must take responsibility for your personal ambitions, learn to negotiate and network, and make some long-term plans for your aspirations in research, teaching, and service that fit with the promotion requirements at your institution. However, when living in a clinical department, it is wise to pay special attention in some areas.

You need to stretch yourself to find, and take advantage of, opportunities. There will be some uncharted or unfamiliar territory in your local environment (eg, clinical jargon, different culture from a basic science department, diverse missions of individual faculty, priorities that extend beyond what you can contribute as a basic scientist). Being shy or keeping yourself in the lab all the time is not going to optimize your potential. Make sure to take all the good opportunities you can find in both your local environment, while simultaneously cultivating collegial interactions with your basic science colleagues. Diversity is strength.

Get on the right page with performance expectations in your department or division. The expectations in clinical departments for amounts of teaching and service, as well as salary coverage on research grants, are often dramatically different from basic science departments.<sup>3,4</sup> It is common to receive conflicting information from basic and clinical colleagues about what you should be doing. Seek out these informed opinions early, and if a murky area emerges, work to resolve it quickly. Work closely with the head of your department or division, and also confer with the heads of promotion and tenure committees. Consciously seek out a mentor who has the most balanced insights into these areas and who can guide your thinking, while providing a frank appraisal of your achievements. Leaders in academic institutions all know that there is no single recipe for success, and that every faculty member is different. Conversely, they will also tell you that they know success when they see it. Far from being a contradiction, this pair of statements illustrates the value of making sure your strategy for success is going to be viewed by all as the best one.

Ambition drives success, and for some people success drives ambition. Clinical departments can have expanded resources compared with basic science departments, but those resources may have limitations. A PhD scientist needs to be aware of the tension that can exist between the clinical (money earning) and research (money spending) missions. Those who generate the clinical dollars want to see good investments made with those dollars. The difference between a request made based on "I want" versus "I need" is often an embarrassingly wide crevasse. Expansion of your research agenda needs to be justified, budgeted realistically, and ideally be of clear benefit to

others than just you.<sup>5</sup> The more you can push your requests (and research work) to take advantage of clinical strengths or concerns, the higher you climb on the ladder of priority.

Manage the timing of your commitments. In most cases, research success always takes highest priority for heavy and early time investment, simply because if that part of your promotion dossier does not look strong, the rest of your contributions may not matter to the promotion board.<sup>3,4</sup> You need to develop a 5-year plan with realistic benchmarks for success, and frequently reassess for any holes in your plan (like when NIH funding rates plummet). This can feel painful if you have had setbacks, but an honest appraisal means you will not face surprises later. Everyone needs to recognize (and in an ideal world address) their weaknesses. When your research program starts to mature with funding and personnel, that is often the time to pick up additional roles in teaching and national service. You can often build momentum for your research recognition by being visible in service to national societies, and when living in a clinical department you certainly would be wise to include work with societies that serve both the clinical and research missions (like the AGA and AASLD), as discussed.

As a closing note in this section, whatever you decide to do to increase your visibility, both locally and nationally, be careful to avoid overcommitting. You will attract precisely the wrong sort of reputation if you do not follow through on assignments. You should also be wary of becoming so involved in committee work that it distracts you from your primary mission as a junior faculty member—securing publications and support for your research. Select a couple of positions that are well-aligned with your interests and where you feel you can make a difference. The overall balance of time in your portfolio of activities should reflect the lessons learned about career expectations in your department or division.

## Great Expectations

The field of digestive diseases needs basic scientists, now more than ever. Although there are some different costs and expectations for a PhD in a clinical department, holding such a position provides enhanced access to the spectrum of clinically oriented questions that flows from fundamental findings, and can provide both personal and professional benefits.

If you are a PhD joining a clinical department, do:

- Actively engage your clinical peers to build a translational knowledge base and vocabulary;

- Accept that you will be uncomfortable and know little about some topics;
- Help your clinical colleagues learn about your work and interests;
- Make yourself valuable in your department;
- Engage with professional societies in your scientific area that promote both clinical and basic research;
- Seek leadership positions at home and in societies; and
- Get knowledgeable about performance expectations for promotion.

Do not:

- Hide in your lab waiting for the world to notice you;
- Treat yourself as a second class citizen because you are “only a PhD”;
- Be an uninvolved departmental citizen;
- Avoid clinical presentations because “It’s not what I do”; or
- Assume that clinical and basic science positions are equivalent for promotion expectations.

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## Conflicts of interest

The authors disclose no conflicts.



## Using Bibliometrics to Advance Your Academic Career

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Academic promotion on the tenure track follows a long tradition of evaluation of an individual's scholarly accomplishments, and depends on many factors, including national and international impact on a field. The traditional approach relies on letters vouch-

ing for the candidate, an approach which dates back to at least 250 BC, in Asclepiades' letter to Zenon vouching for the good character of Philo<sup>1</sup> to help Philo find employment.

Although this tradition is reflected in requirements for letters from leaders in a field to vouch for the qualifications of a tenure candidate, this approach is far from evidence based, and impact on a field is difficult to quantify. Letters of reference are subjective, and prone to bias, leading to a requirement that they be at "arm's length." Unfortunately, "arm's length" letters often cannot highlight progress that is not visible on a national level. Simplistic approaches to quantifying an individual's impact on a field are often used informally. These include simply counting the number of published papers, counting only papers in "top tier" journals, or counting only papers that are not reviews. These decisions on which papers "count" made by promotion committees are arbitrary. These approaches do not measure the impact of the papers themselves, only whether and where they have been published. Although a tree may fall in a forest without being heard, many papers are published without being read or cited, even in high-impact journals. This has led researchers in physics, business, and economics to address this problem with quantitative analysis, leading to the birth of a new field, bibliometrics, the measurement of scholarly output.

Advancement of an academic career depends on many factors beyond scholarly output, including research funding, participation in national meetings and organizations, and contributions to the local institution, but scholarly output seems to be the most de-

bated. Bibliometric approaches have been proposed to establish an objective means to measuring academic productivity.

### Bibliometric Measures of Productivity and Impact

The *h*-index was introduced by Hirsch<sup>2</sup> to quantitatively measure the impact of a scientist's published works. The *h*-index (*h*) of an individual is defined as their number of papers ( $N_p$ ) that have been cited at least *h* times each, and their other ( $N_p - h$ ) papers all have fewer than *h* citations each. For example, a faculty member who has published 30 papers, with their top 7 papers cited 30, 27, 23, 18, 15, 11, and 7 times, respectively, and their other 23 papers have been cited  $\leq 6$  times, would have an *h*-index of 7. Examples of publications with citations and *h*- and *g*-indices for young scholars are presented in Table 1.

The *h*-index provides a quantitative assessment of both the quantity (number of papers) and the impact (citations to these papers) of an individual's published work,<sup>3</sup> and has been shown to be a valid measure of productivity in Nobel prize winners, members of the National Academy of Sciences, and postdoctoral fellows.<sup>2,4</sup> An investigator cannot have a high *h*-index without publishing a substantial number of papers. Published papers need to be frequently cited by other academics to count for the *h*-index. The *h*-index is now routinely included in citation reports on ResearcherID.com (based on the Web of Science subscription database) and Google Scholar, and considered by some tenure committees. Some institutions now include an "academic portfolio" in the tenure package to allow the presentation of the case for national and international impact of one's scholarship.

The *h*-index has several drawbacks. First, the *h*-index counts all papers above the investigator's *h* threshold equally, which led Egghe to formulate the *g* index,<sup>5</sup> defined as the (unique) largest number such that the top *g* articles received (together) at least  $g^2$  citations. The *g*-index can highlight investigators who have made a big impact with relatively few high-quality papers, who may not shine through the lens of the *h*-index.



**Table 1.** Table of Early Career Bibliometric Examples With <20 Publications

Publications ranked by citation number	Author 1	Author 2	Author 3	Author 4	Author 5
1	37	88	24	532	262
2	18	67	8	150	109
3	18	62	8	106	44
4	3	52	1	36	33
5	2	50	1	17	20
6	2	31	0	13	20
7	2	23	0	9	19
8	1	21	0	4	10
9	1	19	0	3	9
10	1	15	0	1	5
11	0	14	0	0	4
12	0	9	0	0	3
13	0	9	0	0	3
14	0	7	0	—	3
15	0	3	0	—	2
16	0	1	—	—	2
17	—	0	—	—	1
18	—	0	—	—	0
19	—	—	—	—	0
20	—	—	—	—	—
<i>h</i> -index	3	11	3	7	9
<i>g</i> -index	9	19	6	13	19

Another criticism of the *h*-index is that it can never decrease, and may not reflect current productivity. The contemporary *h*-index, *h<sub>c</sub>*, addresses this, by weighting citations to recent papers more than those of older articles.<sup>6</sup> With a standard parameterization of 4, citations count 4 times for an article published in the current year; for an article published 4 years ago, each citation counts once; and for an article published 8 years ago, each citation counts as one half of a citation. Other criticisms of the *h*-index include that it gives equal credit to review articles and original research, that it does not account for author order, and that it is potentially susceptible to self-citation.

These indices have been difficult to calculate and compare in the past, but recent freeware tools (Google Scholar, The ResearcherID website, the Scopus website [limited to papers after 1994], and Harzing's PoP) have made the *h*-index easily accessible. Harzing's PoP<sup>7</sup> is free to download, and was used in our investigation of bibliometrics in gastroenterology because it calculates the *g*-index and *h<sub>c</sub>*-index, and provides listings of published papers to help with author disambiguation. Each calculation tool bases its calculations on a slightly different database of publications, and will produce slightly different (but highly correlated) index values. Google Scholar, which covers all PubMed citations and includes many web citations, tends to produce higher bibliometric indices than the other tools.

## Bibliometric Indices in Gastroenterology

To evaluate the validity of these indices in the field of gastroenterology, we first examined the indices of American Gastroenterological Association Julius Friedenwald Medal winners for lifelong contributions to the field of Gastroenterology in the years 1990–2010. Among these award winners, the *h*-, *g*-, and *h<sub>c</sub>*-indices for 10 are listed in Table 2. These are quite high values compared with Nobel Prize winners in physics, who had *h*-index values between 20 and 80, with a peak between 34 and 39.<sup>2</sup> These *h*-index values between 47 and 82 reflect their status as giants in the field of gastroenterology. There is considerable variation between fields, because publication rates and citation rates tend to be higher in biology and medicine and lower in physics and mathematics. Note that most of these winners are now retired, so the contemporary *h<sub>c</sub>*-values listed are quite a bit lower than the corresponding *h*-index values during the prime of their careers.

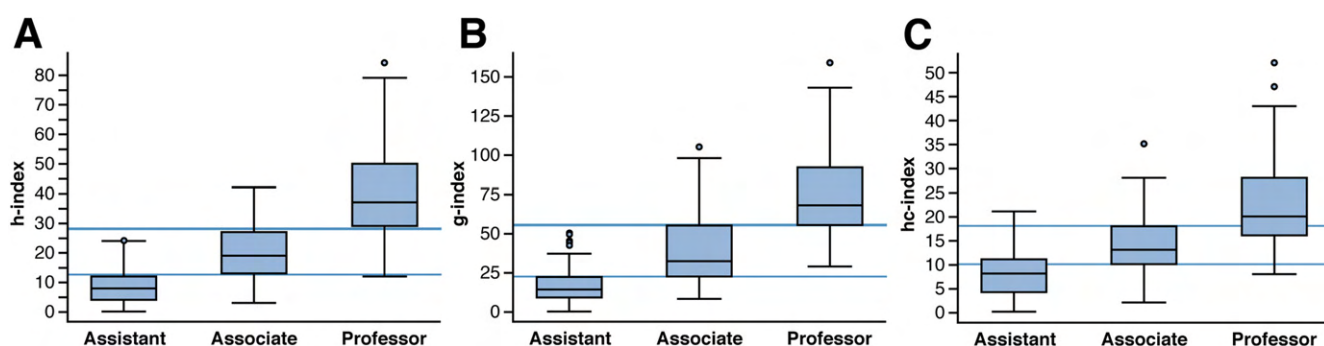
## Bibliometric Values by Academic Rank

To further test the validity of bibliometrics in gastroenterology, we evaluated the bibliometric values of tenure-track faculty members in 5 highly regarded gastroenterology divisions across the United States. We included the University of Michigan, the University of California at Los Angeles, the University of California at San Francisco, the University of Texas Southwestern, and The Johns Hopkins University. Faculty members were identified from university web sites, and were excluded if they had appointments that were emeritus, volunteer, affiliated, adjunct, clinical, or located at a different campus. Bibliometric values were calculated using Harzing's PoP (available from: [www.harzing.com](http://www.harzing.com)).

Searches were performed using the 'Multi-Query Center,' using the following author string with combination of full name and author initials: 'Peter D R

**Table 2.** Bibliometric Values for 10 Recent AGA Julius Friedenwald Medal Winners, for Lifetime Contributions to Gastroenterology

<i>h</i> -Index	<i>g</i> -Index	Contemporary <i>h</i> -Index ( <i>h<sub>c</sub></i> )
82	135	37
78	140	42
72	120	25
64	104	19
59	97	16
52	80	19
50	83	15
50	80	19
48	86	27
47	88	15



**Figure 1.** (A) *h*-Index by academic rank. The *h*-index is displayed as box and whisker plots by academic rank, and transition points at  $h = 11$  from assistant to associate, and  $h = 27$  from associate to full professor, are demarcated as blue horizontal lines. (B) *g*-Index by academic rank. The *g*-index is displayed as box and whisker plots by academic rank, and transition points at  $g = 22.5$  from assistant to associate, and  $g = 55.5$  from associate to full professor, are demarcated as blue horizontal lines. (C)  $h_c$ -Index by academic rank. The  $h_c$ -index is displayed as box and whisker plots by academic rank, and transition points at  $h_c = 10$  from assistant to associate, and  $h_c = 18$  from associate to full professor, are demarcated as blue horizontal lines.

Higgins or PDR Higgins or Peter Higgins,' etc, with only the Subject Areas "Biology, Life Sciences, Environmental Science" and "Medicine, Pharmacology, Veterinary Science" selected. For each author, all papers with more than  $h$  citations were manually reviewed. Outlier papers in subject areas outside the author's common field of study were individually inspected for disambiguation, looking for discrepancies in associated academic institution, dates of publication, or other identifying information. Authors associated with true outlier papers were entered into the 'None of the words' search box to exclude these. Clean data sets were independently generated by RWS, KS, and PDRH and compared for discrepancies. When an *h*- or *g*-index varied by  $\pm 3$  points, the authorship discrepancies were reviewed and a final publication record was agreed upon.

The bibliometric values by academic rank can be seen in Figure 1 and Table 3. Although there is clearly overlap by rank for *h*-values, there is frequently a transition from assistant to associate rank at  $h = 11$ , and from associate to professor at  $h = 27$  (Figure 1). Similar transitions can be seen at  $g = 23$  for associate professor and  $g = 53$  for the professor rank. Although there is some separation of the contemporary *h*-index between assistant and associate professors at  $h_c = 9$ , there is much less separation between associate and full professor. This may occur because full professors are involved in more leadership and administrative work, reducing their current research productivity. An

$h_c$  of 19 is the median for full professors and the 75th percentile for associate professors.

## Using Bibliometric Values to Make an Objective Case for Promotion

Bibliometrics can be used in gastroenterology to make a case for promotion. For an assistant professor seeking tenure, an *h*-index  $>11$ , a *g*-index  $>23$ , and an  $h_c >9$  all objectively strengthen the case for tenure. For an associate professor seeking promotion to full professor, an *h*-index  $>27$ , a *g*-index  $>53$ , and an  $h_c >19$  all objectively strengthen the case for promotion. Bibliometric values for promotion at other institutions may be lower, but these values can provide a benchmark for comparison from 5 examples of GI divisions in the United States.

## Using Bibliometric Values to Select a Fellowship

Evaluating the training potential of a gastroenterology division is quite difficult for medical residents. Identifying a pool of talented mentors can be difficult, especially when the fellowship candidate is not yet decided on a specific field. Ideally, a fellowship program would offer strong clinical training and a number of active and productive researchers to serve as mentors. Identifying active and productive faculty members who can serve as mentors can be difficult for someone outside the division. Although bibliometrics cannot quantify the mentorship potential of individual faculty, evaluating the research potential of a division can be done by calculating the divisional *h*, *g*, or  $h_c$  value. The divisional  $h_g$ -value ( $D_h$ ) is defined as the largest number such that the top  $D_h$  faculty members have an *h*-index of at least  $D_h$ . The divisional *g* value  $D_g$  is defined as the largest number such that the top  $D_g$  faculty members have an *h*-index of at least  $D_g$ . The

**Table 3.** Average Bibliometric Values by Rank at 5 Esteemed Gastroenterology Divisions

Rank	<i>h</i> -Index	<i>g</i> -Index	$h_c$ -Index
Assistant professor	7.7	15.4	7.1
Associate professor	18.9	38.8	13.4
Professor	37.0	70.2	20.8

**Table 4.** Divisional Bibliometric Values at Five Gastroenterology Divisions

Division	Divisional $h$ -Index	Divisional $g$ -Index	Divisional $h_c$ -Index
A	21	26	15
B	18	20	15
C	16	20	14
D	16	20	12
E	13	16	12

divisional  $h_c$  value  $Dh_c$  is defined as the largest number such that the top  $Dh_c$  faculty members have an  $h_c$ -index of at least  $Dh_c$ . All of the divisions evaluated in this study are excellent fellowship training programs, and represent benchmarks for comparison, presented in Table 4. These divisional bibliometric values roughly estimate the number of highly productive research faculty in each division.

## Problems With Bibliometrics

Author name disambiguation is commonly acknowledged as a problem in establishing a publication profile for bibliometric analysis. Authors with similar initials and surnames are identified as the same person by blind searches, as on PubMed, creating an inaccurate conglomeration of manuscripts by  $>1$  author. This is a particular problem for common last names, because PubMed and many journals routinely present the author name as the first 2 initials and last name of each author. For example, the rapid increase in scientific productivity in China has made a common surname like Lee problematic for author disambiguation. Frequently, sorting out which “PD Higgins” wrote a particular paper is increasingly difficult. In the case of our senior author, there is a very productive radiation oncologist who also publishes as PD Higgins, leading to the adoption of PDR Higgins as a publishing name.

Investigators can minimize authorship ambiguity issues using a few strategies. First, search for your initials and surname on PubMed to determine whether you have a *doppelgänger*—someone with a similar or identical name—which will create ambiguity when you publish. Second, publish consistently with the same name, and if possible, use additional middle initials (maiden or taken religious names can be useful here), because PubMed and Google Scholar are now including  $>2$  initials in their datasets. If you lack middle initials, consider adding an additional initial to make your publishing name unique. Choosing to use Q or Z may be helpful in maintaining a unique publishing identity. New services including MyNCBI and Re-

searcherID.com allow individual researchers to create an online list of their own actual publications, effectively putting disambiguation in the hands of the author. A new initiative, Open Researcher and Contributor ID (ORCID) has proposed assigning unique identifiers to all authors.

Different tools calculate slightly different indices. Online tools like ResearcherID.com, Google Scholar, and Scopus offer rapid  $h$ -index calculations, but limit the user’s ability to refine an author’s publication list and exclude irrelevant publications. Scopus and ResearcherID.com have been shown to correlate well, despite their slightly different values, which are in part owing to overlapping but different databases of publications. The bibliometric values in this paper were all calculated with Harzing’s PoP to allow review of the identified papers and careful manual disambiguation.

Bibliometrics is a rapidly advancing field that promises to incorporate an objective element into a long-standing process of measuring scholarly impact. The availability of electronic databases and downloadable tools to ease these calculations will likely increase their use, and add an objective measure to the subjective letter of reference.

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## Conflicts of interest

The authors disclose no conflicts.