



Primary Care Diabetes Fellowship Programs: Developing National Standards

Jay H. Shubrook,¹ Beatriz Francesca Ramirez,²
Amber M. Healy,^{3,4} Lenard Salzberg,⁵
Sumera Ahmed,¹ Howard Feinberg,¹ Mark Schutta,⁶
Frank L. Schwartz,⁷ and Cecilia C. Low Wang⁸

The rapid and constant increase in the number of people living with diabetes has outstripped the capacity of specialists to fully address this chronic disease alone. Furthermore, although most people with diabetes are treated in the primary care setting, most primary care providers feel under-prepared and under-resourced to fully address the needs of their patients with diabetes. Addressing this care gap will require a multifaceted approach centering on primary care training in diabetes and its complications. One-year diabetology fellowship programs are well situated to provide this training. Previous research has shown that the higher the diabetes-specific volume of patients seeing a primary care physician was, the better the quality outcomes were across six quality indicators (eye examinations, LDL cholesterol testing, A1C testing, prescriptions for ACE inhibitors or angiotensin receptor blockers, prescriptions for statins, and emergency department visits for hypoglycemia or hyperglycemia). Primary care diabetes fellowships have existed for many years, but the number of fellowships and fellowship positions has recently grown dramatically. This article proposes a standardized curriculum for such programs and makes the case for increasing their number in the United States.

Diabetes is a major clinical and public health threat. While the incidence and prevalence of this complex disease have

rapidly increased in the United States, the number of health care providers (HCPs) focusing on diabetes treatment has not. The number of endocrinologists, the specialists traditionally trained to treat diabetes, has remained relatively stable (1,2). There are significant challenges within the practice of endocrinology that make it unlikely that the number of endocrinologists will increase significantly in the near future. Endocrinology is one of the lower-paying internal medicine specialties, which may account for fewer physicians choosing this field, and most endocrinologists are located in academic medical centers and devote only a portion of their time to clinical care. It has been estimated that 75% of U.S. counties have no endocrinologist, creating large gaps in access to these specialists (3,4). Furthermore, many endocrinologists focus on other areas of the specialty (e.g., thyroid disease) rather than on diabetes care. Consequently, the gap in availability of specialized diabetes HCPs continues to widen.

Currently, 85% of people with diabetes are treated by primary care providers (PCPs). Although this represents mostly patients with type 2 diabetes (5), a substantial portion of patients with type 1 diabetes also get their diabetes care from a PCP (6). If currently practicing endocrinologists treated every person with type 1 diabetes in the United States, they would each need to see seven people with type 1 diabetes every day, leaving few appointments available for people with type 2 diabetes or any other endocrine disorder (6). Fewer than 10% of people with diabetes have type 1 diabetes; however, many PCPs feel ill-prepared to actively manage both type 1 and type 2 diabetes and their complications (7,8). With the projected growth of diabetes in the United States, this gap will only increase, creating challenges for both providers and patients that can lead to suboptimal care (9). Now is the time to change that.

Primary care diabetes fellowship programs have proven to be successful models to deliver the type of intensive training needed to competently care for the growing numbers of patients with complex diabetes. To date, more than 50 PCPs have completed a 1-year diabetes fellowship. Data from recent surveys demonstrate excellent

¹Touro University California College of Osteopathic Medicine, Vallejo, CA; ²East Carolina University Brody School of Medicine, Greenville, NC; ³Ohio University Heritage College of Osteopathic Medicine, Athens, OH; ⁴Ohio Health Physician Group Heritage College Diabetes and Endocrinology, Athens, OH; ⁵Duke Southern Regional Area Health Education Center, Fayetteville, NC; ⁶University of Pennsylvania, Philadelphia, PA; ⁷West Virginia University/Camden Clark Medical Center, Parkersburg, WV; ⁸University of Colorado, Aurora, CO

Corresponding author: Jay H. Shubrook, Jay.Shubrook@tu.edu

<https://doi.org/10.2337/cd20-0055>

©2020 by the American Diabetes Association. Readers may use this article as long as the work is properly cited, the use is educational and not for profit, and the work is not altered. More information is available at <https://www.diabetesjournals.org/content/license>.

performance outcomes among all trainees, along with a dedication to practice exclusively in the care of people with diabetes (10). PCPs who have completed diabetes fellowships have become public health leaders and have joined the faculty at medical schools, teaching hospitals, and fellowship programs in diabetology and endocrinology. Some graduates practice in traditional primary care settings with a special focus on diabetes, whereas others have joined specialty practices (11). Although this type of training is not the entire solution to the diabetes specialty shortage, it is an important partial solution.

Necessity and History of Fellowships

The birth of diabetology started with Elliot Joslin, MD, the pioneer in diabetes care. While he was attending Harvard Medical School, his aunt developed diabetes, an experience that inspired him to devote his career to understanding and finding treatments for the disease. For many years, physicians sought out Harvard—now the Joslin Clinic—for its 1-year intensive diabetes training. Fred Whitehouse, MD, was the first physician to earn a certificate of completion of the 1-year diabetes fellowship. This practice continued for 30 years before the program was combined with endocrinology training in a 2-year endocrine fellowship in the late 1980s (12).

Nearly 20 years ago, two endocrinologists, Robert J. Tanenberg, MD, and Frank Schwartz, MD, practicing in two areas of the country with extremely high prevalence rates of diabetes, were each faced with difficulty recruiting endocrinologists to join their practices. Each, unbeknownst to the other, began training PCPs to become diabetologists (clinicians with rigorous training in diabetes care) following the Joslin model. Both programs were housed in academic centers (East Carolina University in Greenville, NC, and Ohio University Heritage College of Osteopathic Medicine in Athens, OH), where support and resources were available to initiate their respective programs. In 2004, both programs accepted their first fellows, and both have been accepting one to two fellows per year ever since.

Several graduates from these programs became faculty at these and other diabetes fellowship programs or opened new programs. Recently, the number of diabetes fellowship programs has expanded. There are now four programs nationally that have graduated fellows, and two new programs whose first fellows began training in July 2020. In addition to the two original fellowships, these programs are offered at Duke Southern Regional Area Health Education

Center (AHEC), Touro University College of Osteopathic Medicine California, the University of Colorado, and the University of Pennsylvania.

Initiative to Expand Diabetes Fellowships

In January 2020, the American Diabetes Association (ADA) convened a 1-day meeting in San Francisco, CA, with program directors from each of these institutions, current and past fellows, and experts in graduate medical education (GME) to address strategies to support and expand diabetes fellowships. Invitations were sent based on involvement with any of the known fellowship programs. Attendees included representatives from the fields of family medicine, internal medicine, and endocrinology. This article summarizes recommended standards for primary care diabetology training that were developed at that conference and describes the supplemental training needed to prepare providers to help bridge the gap in specialty diabetes care between endocrinology and primary care disciplines. This article also can serve as a reference for future programs. A listing of all conference participants is provided at the end of the article.

Overview of Current Diabetes Fellowships Programs

Physicians must be board-eligible or board-certified in family medicine or internal medicine to apply for a diabetes fellowship. During the 1-year program, physicians learn a wide range of clinical skills. These skills include diagnosing and managing various forms of diabetes (type 1 diabetes, type 2 diabetes, latent autoimmune diabetes of adulthood [LADA], monogenic forms of diabetes, ketosis-prone diabetes, and gestational diabetes mellitus [GDM]), helping patients make therapeutic lifestyle changes, motivational interviewing, comanaging medical complications of diabetes (i.e., diabetic foot ulcers, diabetic retinopathy, and diabetic kidney disease, including end-stage renal disease and renal replacement therapy), implementing pharmacotherapy for diabetes, initiating and maintaining insulin therapy, implementing and interpreting data from continuous glucose monitoring (CGM) systems, initiating and managing insulin pump therapy, and providing care for hospitalized patients with diabetes. Fellows work as part of a team of HCPs that includes diabetologists, nephrologists, cardiologists, podiatrists, ophthalmologists, maternal-fetal medicine specialists, pediatric endocrinologists, certified diabetes care and education specialists, nurses, pharmacists, and psychologists. Although different

programs place varying emphasis on the inpatient care of diabetes, all programs prepare fellows for the care of acute complications of diabetes (e.g., hypoglycemia, diabetic ketoacidosis [DKA], and hyperglycemic hyperosmolar syndrome [HHS]) in the hospital. Some programs also include an emphasis on obesity medicine and lifestyle medicine.

Proposed Core Components of a Diabetes Fellowship Program

Table 1 lists the key features of a 1-year diabetes fellowship program, and Table 2 shows a sample weekly schedule for a diabetes fellow.

Core Curricular Elements

The core curriculum is the foundation of diabetes fellowship education and consists of the basic areas of instruction required of all fellowship programs. The core curriculum breakout session at the ADA's January 2020 diabetes fellowship conference outlined the following elements of a standardized curriculum for all diabetes fellowship programs.

1. Clinical Care

This topic encompasses direct care of diabetes in clinic and hospital settings, with training that addresses social determinants of health (e.g., food insecurity, medication affordability, and homelessness), practice management (e.g., chart documentation, billing and coding, and medication prior authorizations), and adequate and timely use of resources to assist patients.

2. Core Rotations and Direct Patient Care

In the list below, tier 1 represents essential components of all programs, tier 2 are highly recommended components but may vary from one program to another, and tier 3 are recommended if available at the program but not required.

- Tier 1. Diabetes continuity clinics and inpatient diabetes management. Each fellow shall provide at least 1,000 hours of direct patient care in diabetes and/or diabetes complications. There must be availability of an acute care hospital for fellows to be trained in inpatient management of diabetes patients and acute diabetes complications (e.g., hypoglycemia, DKA, and HHS).
- Tier 2. Podiatry and/or wound care, maternal-fetal medicine and/or high-risk obstetrics/gynecology,

TABLE 1 Key Components of a 1-Year Diabetes Fellowship Program

A.	Program personnel and resources (≥ 0.5 full-time equivalent position): <ul style="list-style-type: none"> • Fellowship director (should be endocrinologist or diabetologist) • One core physician faculty for every 1.5 fellows (i.e., family physician, internist, endocrinologist, or diabetologist)
B.	Other personnel: The institution and the program must jointly ensure the availability of all necessary professional, technical, and clerical personnel for the effective administration of the program. Necessary personnel may include an administrative assistant, dietitians, behavioral health specialists (e.g., psychologists or licensed clinical social workers), pharmacists, and nurses.
C.	Patient population: There must be a patient population with a variety of clinical problems and stages of disease, including patients with type 1 diabetes, type 2 diabetes, and the microvascular and macrovascular complications of diabetes.
D.	Educational program: The education will encompass didactic lectures and direct patient care as described in detail under Core Curricular Elements.
E.	Scholarly activity: Each fellow must conduct QI or research and/or complete a scholarly project that should be presented regionally or nationally.
F.	Technology resources and education: The program must provide education and clinical experience with relevant diabetes-related technology (e.g., insulin pumps and CGM devices).
G.	Conference attendance: Each fellow shall attend a national diabetes conference (e.g., an American Diabetes Association conference) as assigned by the program director.

pediatric diabetology and diabetes camp, nutrition, clinical research and dissemination in the medical literature, and telehealth and remote monitoring.

- Tier 3. Neurology, cardiology, nephrology, ophthalmology, transplant medicine, lipidology, obesity medicine, bariatric medicine (pre- and post-surgery), eating disorders, and general surgery.

3. Didactic Lectures

Lectures will cover diabetes and related topics in depth, including the pathophysiology of diabetes; therapeutic lifestyle change and motivational interviewing; pharmacologic treatments; nationally recognized guidelines (i.e., from the American Diabetes Association, the Endocrine Society, the American Association of Clinical Endocrinologists, and the American College of Physicians); landmark clinical trials; diabetes complications; psychosocial aspects of diabetes; advanced insulin delivery devices; state-of-the-art insulin pumps and CGM technologies, including hybrid closed-loop systems; and medical emergencies in diabetes. Additional topics may be included by individual programs.

4. Research and Quality Improvement

This topic includes training in evidence-based medicine with journal club sessions. Fellows will be trained on how to evaluate and interpret research articles and submit scholarly activity, including but not limited to presentation of clinical trial results, posters, case reports, or abstracts at the respective institution's research days or at nationally or internationally recognized conferences and scientific meetings. Quality improvement (QI) projects can be considered part of scholarly activities.

5. Professional Development

As part of professional development, fellows must attend at least one scientific conference (e.g., the American Diabetes Association's Scientific Sessions). Programs may also incorporate faculty development training, if feasible.

6. Advocacy and Community Engagement

Fellowship programs must aim to provide some form of population health training. Fellows will be strongly encouraged to participate in community programs such as diabetes camps, free clinics, and community education programs such as the National Diabetes Prevention Program or the Diabetes Empowerment Education Program.

Proposed Competencies for Graduates

Diabetes fellowship graduates will have the ability to practice in multiple settings, including being embedded in a primary care practice, within a specialty center (e.g., cardiology), or within a diabetes specialty setting. The competencies required for graduation are listed in Table 3.

Fellow competencies should be based on "entrustable professional activities" in the six core competencies developed by the Accreditation Council for Graduate Medical Education (ACGME) (13) and used to evaluate fellow performance during the program. The six core competencies include patient care, medical knowledge,

practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice.

Proposed Testing and Certification Process

There is no single board exam for this fellowship. Instead, graduates of these programs sit for many different exams, including those for National Committee for Quality Assurance (NCQA) recognition, the Board-Certified in Advanced Diabetes Management (BC-ADM) certification, the Certified Diabetes Care and Education certification, and American Board of Obesity Medicine certification.

The work group addressing this topic at the ADA's January 2020 diabetes fellowship meeting recommended that a national comprehensive exam be incorporated into the requirements for this fellowship specialty. The exam should be a standardized, multiple-choice test developed from the six ACGME core competencies. Candidates should be allowed up to three attempts to pass the exam. The work group also recommended that physicians who complete a 1-year fellowship in diabetes and pass the required components of the program, including the comprehensive exam, should earn recognition as a diabetologist.

The diabetology fellowship programs' curriculum and training should be guided by the ACGME's program requirements for GME in endocrinology, diabetes, and metabolism, which outline required diabetes-related competencies.

Proposed Inclusion of Current Diabetes Specialists

Endocrinologists

Endocrinology training competencies include diabetes, endocrinology, and metabolism. Therefore, all endocrinologists are also considered diabetologists by default, even if diabetes is not the focus of their practice. No action is needed by endocrinologists to declare themselves a diabetologist.

TABLE 2 Sample Weekly Schedule for a Diabetes Fellow

	Monday	Tuesday	Wednesday	Thursday	Friday	Weekend
Morning	Diabetes clinic	High-risk obstetrics clinic	Didactics	Diabetes clinic	Primary care clinic	Periodic inpatient call
Afternoon	Pediatrics/subspecialty diabetes clinic	Diabetes clinic	Independent study/research	Diabetes clinic	Subspecialty clinic	Periodic inpatient call

TABLE 3 Competencies Required for Graduation From a Diabetes Fellowship Program

A.	Outpatient diagnosis and management, including: <ol style="list-style-type: none"> 1. Type 1 diabetes 2. Type 2 diabetes 3. Diabetes in pediatric populations 4. Adults, including the elderly with diabetes 5. Family planning and pregnancy planning in those with diabetes 6. Therapeutic lifestyle change (i.e., nutrition, physical activity, sleep, and stress management) 7. Role of social determinants of health as they relate to diabetes and obesity 8. Diabetes in pregnant patients (i.e., pre-gestational diabetes, GDM) 9. Diabetes in the setting of renal disease, liver disease, and cardiovascular disease 10. Atypical forms of diabetes (i.e., ketosis-prone diabetes, LADA, monogenic diabetes, and secondary diabetes) 11. Diabetes technology (e.g., CGM devices, insulin pumps, alternative insulin delivery devices, methods of administering glucagon)
B.	Inpatient management, including: <ol style="list-style-type: none"> 1. Diabetes emergencies (i.e., DKA, HHS, severe hyperglycemia, and hypoglycemia) 2. Intravenous insulin infusions 3. Perioperative management of patients with diabetes 4. Diabetes management during critical care 5. Pregnant patients during labor and delivery 6. Diabetes management during steroid-induced hyperglycemia 7. Coordination of care during transition to an outpatient setting
C.	Ancillary management: diagnosis and management, in conjunction with patients' PCP, of diseases related to diabetes, including: <ol style="list-style-type: none"> 1. Hypertension 2. Dyslipidemia 3. Obesity
D.	Complications management: prevention and surveillance of the microvascular and macrovascular complications, as well as nonalcoholic fatty liver disease, obstructive sleep apnea, cheirography, and other complications

PCPs

Many PCPs already possess the competencies required of diabetes fellowship program graduates. These PCPs would be afforded the opportunity to “test into” the specialty by taking the exam described above. The work group recommended a 24-month window for testing once the specialty is officially recognized.

Challenges Facing Primary Care Diabetologists

Numerous challenges exist for PCPs who practice as primary care diabetologists, and these must be addressed for diabetes fellowship programs to grow. A 2018 survey of diabetes fellowship graduates found that their biggest barrier was the lack of specialty recognition (11).

Employment, insurance reimbursement for consultations, and recognition among peers and payers were identified as related and common challenges (9).

Employment challenges include how to define the specialty without board certification. Without a board exam, it is difficult to determine the benchmark that would allow credentialing boards and payers to recognize diabetologists as consultants. It should be noted that this recognition is aimed more at enhancing PCPs' ability to provide expert diabetes care than at financial gain; working as a diabetologist is not likely to be more lucrative than working as a general PCP because patients can be seen per day in the latter than in the former given the generally greater complexity of patients with diabetes. Some health systems have used indicators such as NCQA recognition, BC-ADM certification, or practice within a specialty environment such as a diabetes and endocrine center to establish competency in diabetology.

Many employers and payers have recognized the value and role of diabetologists but have created hybrid models that can be difficult to maintain. For example, in the primary care outpatient setting, employers allow PCPs limited time to practice as diabetologists (e.g., 1 day/week set aside for diabetes patients with the rest of the week devoted to general primary care). This situation has the potential to lead to conflicts because some patients will view a provider as their PCP, whereas others view the same provider as a diabetes consultant. There is a critical need for both diabetologists and PCPs, and both types of practice suffer when providers are forced to split their focus.

Another challenge involves colleagues not understanding the role of diabetologists. Some colleagues might be reluctant to refer to providers who appear to have undergone the same medical training as themselves. Some fellowship graduates have been able to overcome this problem using different strategies such as practicing in separate locations and telling their primary care colleagues that referral to one location constitutes a referral to a diabetology practice, whereas referral to another location is a general primary care referral.

Practice scope and definition have also been challenges. Some endocrinologists believe that the scope of primary care does not include diabetes care, whereas other endocrinologists may be concerned that a part of their diabetes, endocrinology, and metabolism specialty scope of practice is being removed and given to another group of providers. A survey conducted by Healy et al. (11)

revealed that only 48% of the 84 endocrinologists surveyed were supportive of a diabetes fellowship to help with the diabetes burden in the United States. PCPs have also had concerns about diabetology as a specialty. Some PCPs (i.e., those practicing family medicine and internal medicine) do not want to be left out of a primary care subspecialty focusing on diabetes. Some have expressed concerns about patients leaving their practice for another PCP who has the subspecialty certification. These concerns are understandable but provide further evidence that specialty recognition for diabetology is necessary to promote better care for people with diabetes.

Some diabetologists have focused purely on diabetes regardless of their practice location. These physicians typically work as part of an interprofessional team that includes diabetes educators, dietitians, and health psychologists or social workers. This type of arrangement provides PCPs with the resources of a multidisciplinary team to support and provide expanded services to patients with diabetes. These practices typically limit their scope to diabetes and its complications and send all other concerns to the general primary care team. This strategy seems to ease concerns that a diabetologist will take patients away from general PCPs.

Proposed Solutions

To address these challenges, the work group recommended the following measures.

- There must be a clear definition of the primary care diabetologist designation.
- Development of the subspecialty must be inclusive of endocrinologists who are already board-certified in diabetes and PCPs who manage the vast majority of people with diabetes.
- Training such as this required for board certification or a Certification of Added Qualification (a designation of focused practice that certifies one's knowledge and skills in a particular specialty) must be recognized to document competency in the management of diabetes.
- Language must be developed to clearly delineate who qualifies as a diabetologist. The work group recommended the term "fellowship-trained diabetologist" until a board can be approved.
- Activities should be undertaken to increase public and health system awareness of diabetology to promote further recognition of this specialty.
- Support needs to be provided for diabetologists who remain in primary care or public health settings to address the critical access mismatch (i.e., the shortage of specialized diabetes care providers).

Expected Health Outcomes Resulting From Primary Care Diabetology Fellowships

Research has shown that the more visits that are focused on patients' diabetes occur, the better their intermediate outcomes are (14). Furthermore, one study demonstrated that the higher the volume of diabetes-specific visits to a PCP (not specifically those who have completed a diabetes fellowship) was, the better outcomes were across six quality indicators (eye examinations, LDL cholesterol testing, A1C testing, prescriptions for ACE inhibitors or angiotensin receptor blockers, prescriptions for statins, and emergency department visits for hypoglycemia or hyperglycemia) (15). As primary care has moved from the solo practitioner model to provider networks, the services of primary care diabetologists could have positive impacts on entire health care systems. The inclusion of these diabetes specialty providers may result in improved quality of care throughout the primary care setting (16).

Building New Programs to Expand Diabetes Fellowship Training

An important part of the effort to develop national standards for fellowship programs is to outline a plan for increasing the number of programs and expanding training opportunities. The goal of developing primary care diabetologists is to complement and add to existing training—not to replace the training that is already available in endocrinology fellowships or via certification from the ADA or the Association of Diabetes Care & Education Specialists or through NCQA recognition. PCPs and endocrinologists all have vital roles to play in combating the global epidemic of diabetes, its complications, and common comorbidities. Comprehensive clinician training is a cornerstone of evidence-based care.

Although accreditation forms an important foundation upon which the success of future fellowship programs will depend, achieving recognition of a new certification is anticipated to be a lengthy process; thus, the expansion of fellowship programs should occur concurrently with the accreditation development process. Specifying a definition of and criteria for being considered a diabetologist will be an essential aspect of developing an accreditation program. Criteria for recognizing the training and expertise of current diabetes specialists should be included in this definition and when defining criteria for certification.

The standards described in this article can serve as a foundation on which to build, as diabetes fellowship training gains traction and the growth of the primary care

specialty gains momentum. Identifying opportunities to build capacity is part of this process. Successful expansion will require thoughtful consideration of who should receive such training, where that training should be provided, and how best to expand available training opportunities.

Who?

Current diabetes fellowship programs recruit and enroll candidates from primary care house staff training programs in internal medicine and family medicine. Graduates of medicine/pediatrics training programs with a desire to gain more specialized, focused training in diabetes care would also be excellent candidates for primary care diabetes fellowship programs.

A significant proportion of diabetes care is now provided by nonphysician HCPs, or advanced practice providers (APPs). Future diabetes fellowship training programs could expand to include intensive diabetes training for APPs. Several academic medical centers also provide intensive training to APPs, who then work independently on an inpatient hyperglycemia service. This model could be used to develop training for APPs who are interested in a diabetes-focused practice. In addition, for already practicing physicians who would like to develop their diabetes expertise, focused “executive diabetes training programs” could be developed to offer intensive training in a part-time format or over a briefer period of time, akin to “executive MBA” programs that are offered over a series of weekend sessions for busy executives.

The writing committee for this article and attendees at the ADA’s January 2020 conference recognized that many PCPs are not physicians; thus, professionals who are physician assistants or nurse practitioners should also have access to this specialized training. Although worthy of future exploration, a more detailed discussion of this topic is beyond the scope of this article.

Where?

Academic medical centers with existing endocrinology fellowship programs are obvious potential sites for expansion of primary care diabetes fellowships. These programs have the needed infrastructure, including a fellowship program coordinator and an institutional office for GME. A diabetes-specific curriculum and associated teaching materials, including lectures, would need to be created, and the clinical sites and fellowship program structures should be clearly different from the endocrinology fellowship programs of the same institutions. The

two newest diabetes fellowship programs were both started using this model.

In academic centers without existing endocrinology fellowships or those that may lack some of the necessary clinical opportunities for a comprehensive diabetes fellowship, a joint fellowship involving two or three centers could be considered. In such cases, coordination and clear communication will be essential to the successful development of the needed infrastructure and core elements of a diabetes fellowship program. Training in rural and underserved communities should be included whenever possible to help address the overall goals of diabetes fellowship programs and maximize the impact of the providers they train.

How?

Funding is probably the most important issue to address in terms of the mechanics of starting new fellowship programs. A variety of potential funding sources can be considered, including philanthropic and charitable giving, matching funding from institutions or hospitals, grants, and industry support. The costs of a diabetes fellowship program include fellows’ salary and benefits; faculty compensation; professional education funding for conferences, subscriptions, memberships, and educational supplies and resources; and program administration costs. Current fellowship programs are funded in a variety of ways, including all of the methods discussed here except for via industry. Any instances of industry funding would need to be carefully managed to prevent apparent or actual conflicts of interest and should follow guidelines similar to those governing unrestricted educational grants.

Another key step in creating new programs is to raise awareness that diabetes fellowship training is available. Because diabetes fellowships are not currently certified by ACGME and are not part of the National Resident Matching Program, house staff are unlikely to find out about diabetes fellowship training opportunities except through former fellows, word of mouth, or Internet searches. The greater the awareness and the more competitive fellowship training slots become, the more likely it will be that such programs can be sustained by a stable pipeline of incoming trainees.

Ongoing Networking Among Diabetes Fellowship Programs

Connecting individuals who are committed to this effort is of central importance, and this process has already

started with monthly conference calls among current fellowship program directors. This endeavor was accelerated when a working group recently met to take stock of the need for fellowship programs, what has been done since the first fellowships began in 2004, and what more must be accomplished moving forward. Current and future program directors will continue to meet periodically to share ideas, troubleshoot challenges, and move the expansion of the primary care diabetes specialty forward. These connections will help to support the development of new programs and innovation within existing ones as new ideas arise.

To support the establishment of new diabetes fellowship programs, the development of a toolkit has been proposed to help prospective new programs avoid wasting time “reinventing the wheel.” Such a toolkit could include sample curriculums and teaching materials from existing programs, examples of GME applications, sample schedules, and templates for evaluation forms. The toolkit could be made available online in a secure platform and shared among programs. This effort has already begun.

Conclusion

The management of diabetes is complex and has the potential to overwhelm the U.S. health care system. Multiple gaps exist limiting patients’ access to HCPs with expertise in diabetes. These include uneven distribution of diabetes care experts throughout the country and insufficient training opportunities for PCPs, who manage the care of most people with diabetes. A multifaceted approach will be needed to improve this situation.

In an article titled, “The Time Is Now: Diabetes Fellowships in the United States” (17), authors Sadhu et al. describe these issues and state: “We call for the collaboration of medical education institutions, certification organizations, both primary care and endocrinology professional societies, funding organizations, and policy makers. The time has certainly come to create a multifaceted approach to address the shortage of care for the burgeoning diabetes population.”

Primary care diabetology fellowships are one pathway to addressing this public health and diabetes care crisis. Some programs have been operating for more than 15 years, and interest is growing among potential fellows and new program sites.

ATTENDEES

Attendees at the January 2020 ADA diabetes fellowship conference included Sarah Adkins, PharmD, BCACP, Ohio University

Heritage College of Osteopathic Medicine; Sumera Ahmed, MD, Touro University California; Nay Linn Aung, MD, Mohawk Valley Health Systems; Leonard Bertheau, DO, Adventist Health; Shagun Bindlish, MD, One Medical; Babak Bokaie, MD, Northeast Valley Health Corporation; Sarah Bradley, American Diabetes Association; Howard Feinberg, MD, Touro University California; Gopika Gangupantula, MD, Sutter Health; Sandhya Gelou, MD, PeaceHealth Medical Group; Nachida Hamidi-Sitouah, MD, Vidant Health; Amber M. Healy, DO, Ohio University Heritage College of Osteopathic Medicine; Javier Lopez-de-Arco, MD, Orlando Health; Cecilia C. Low Wang, MD, University of Colorado; Jennifer Maizel, MPH, CHES, American Diabetes Association; Carlos Mendez, MD, Medical College of Wisconsin; Basem Mishriky, MD, East Carolina University; Chalak Muhammad, MD, WellSpan Medical Group; Paul Mystkowski, MD, Novo Nordisk, Inc., and the University of Washington; Jan Oakley, DNP, Novo Nordisk, Inc.; Matt Petersen, American Diabetes Association; Kim Pfothenauer, DO, Michigan State University; Beatriz Francesca Ramirez, MD, East Carolina University; Sterling Riddley, MD, Duke Southern Regional AHEC; Archana Sadhu, MD, Houston Methodist; Lenard Salzberg, MD, Duke Southern Regional AHEC; Mark Schutta, MD, University of Pennsylvania; Jay H. Shubrook, DO, Touro University California; Kelsey Simmons, DO, Duke Southern Regional AHEC; and Kathleen Wynne, MD, Ohio State University.

ACKNOWLEDGMENTS

The authors thank the ADA, including Sarah Bradley and Matt Petersen, who organized and convened the January 2020 diabetes fellowship conference. They also thank Merck and Novo Nordisk, Inc., for their financial support of the conference.

DUALITY OF INTEREST

All authors are current or former directors of diabetes fellowship programs. No other potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

All authors contributed to the writing and editing of this document. All of the attendees at the conference contributed to development of the concepts and details included in the manuscript. M.S. and F.L.S. provided editing suggestions. H.F. wrote and oversaw the development of the accompanying ACGME standards. J.H.S. is the guarantor of this work and as such, had full access to all of the data consulted and reported in the development of this article.

REFERENCES

1. The Lewin Group. *A White Paper: Endocrine Clinical Workforce: Supply and Demand Projections*. Available from <https://www.endocrine.org/-/media/endsociety/files/advocacy-and-outreach/other-documents/2014-06-white-paper--endocrinology-workforce.pdf?la=en>. Accessed 10 August 2020
2. Vigersky RA, Fish L, Hogan P, et al. The clinical endocrinology workforce: current status and future projections of supply and demand. *J Clin Endocrinol Metab* 2014;99:3112–3121
3. Oser SM, Oser TK. Diabetes technologies: we are all in this together. *Clin Diabetes* 2020;38:188–189

4. Lu H, Holt JB, Cheng YJ, Zhang X, Onufrak S, Croft JB. Population-based geographic access to endocrinologists in the United States, 2012. *BMC Health Serv Res* 2015;15:541
5. Agency for Health Care Research and Quality. Medical expenditure panel survey. Available from <https://www.ahrq.gov/research/data/meps/index.html>. Accessed 10 August 2020
6. Lal RA, Cuttriss N, Haller MJ, et al. Primary care providers in California and Florida report low confidence in providing type 1 diabetes care. *Clin Diabetes* 2020;38:159–165
7. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA* 2002;288:1775–1779
8. Rushforth B, McCrorie C, Glidewell L, Midgley E, Foy R. Barriers to effective management of type 2 diabetes in primary care: qualitative systematic review. *Br J Gen Pract* 2016;66:e114–e127
9. Centers for Disease Control and Prevention. Diabetes: national and state data. Available from <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>. Accessed 10 August 2020
10. Healy AM, Tanenberg RJ, Schwartz FL, Shubrook JH. Diabetes fellowship in primary care: a survey of graduates. *J Am Osteopath Assoc* 2018;118:538–543
11. Healy AM, Shubrook JH, Schwartz FL, Cummings DM, Drake AJ 3rd, Tanenberg RJ. Endocrinologists' opinions of diabetology as a primary care subspecialty. *Clin Diabetes* 2018; 36:168–173
12. Tanenberg RJ, Cummings DM, Dreyfus KS, Newton CA, Drake AJ 3rd, Lewis MJ. Primary care fellowship in diabetes: an innovative program in postgraduate diabetes education. *Teach Learn Med* 2009;21:334–343
13. Association of American Medical Colleges. The core entrustable professional activities (EPAs) for entering residency. Available from <https://www.aamc.org/what-we-do/mission-areas/medical-education/cbme/core-epas>. Accessed 10 August 2020
14. Sadur CN, Moline N, Costa M, et al. Diabetes management in a health maintenance organization: efficacy of care management using cluster visits. *Diabetes Care* 1999;22:2011–2017
15. Cheung A, Stukel TA, Alter DA, et al. Primary care physician volume and quality of diabetes care: a population-based cohort study. *Ann Intern Med* 2017;166:240–247
16. Shah BR, Hux JE, Laupacis A, Zinman B, Zwarenstein M. Deficiencies in the quality of diabetes care: comparing specialist with generalist care misses the point. *J Gen Intern Med* 2007; 22:275–279
17. Sadhu AR, Healy AM, Patil SP, Cummings DM, Shubrook JH, Tanenberg RJ. The time is now: diabetes fellowships in the United States. *Curr Diab Rep* 2017;17:108