

INSIDE THIS ISSUE

3 Mayo Clinic Endocrine Testing Center

4 The Mayo Clinic Dan Abraham Healthy Living Center Part 2: Nutrition Programs

6 Diabetes Intensive Training Program for Nurse Practitioners and Physician Assistants

The Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic, Rochester, Minnesota

The establishment of endocrinology as a discipline at Mayo Clinic can be traced back to Dr Henry Plummer in the early 1900s. Dr Plummer introduced iodides in the preoperative management of Graves' disease and described toxic multinodular goiter (Plummer disease). The Division of Endocrinology, Diabetes, Metabolism, and Nutrition was formally established in 1967. Today, with 46 clinical endocrinologists, 3 career scien-

tists, and 26 nurse practitioners and physician assistants, it is the fourth largest of the 13 divisions that compose the Department of Internal Medicine at Mayo Clinic in Rochester, Minnesota. The clinical endocrinologists are all located on the 18th floor of the Mayo Clinic Building—forming one of the largest practice-based groups of endocrinologists in the world.

The endocrine division faculty is engaged in



Figure 1. Core group chairs: Pankaj Shah, MD (the diabetes and metabolism and the transplant core groups); Dana Erickson, MD (pituitary-gonad-adrenal core group); Bryan McIver, MB ChB, PhD (thyroid core group); Bart L. Clarke, MD (bone and mineral core group); Ananda Basu, MBBS, MD (hospital core group); Maria L. Collazo-Clavell, MD (outpatient nutrition core group). Not pictured is John M. Miles, MD, of the hospital nutrition and lipid core groups.



Figure 2. Present and past division chairs William F. Young Jr, MD, and John C. Morris III, MD.

practice, research, education, and divisional and institutional administration. Over 30% of faculty have extramurally funded research time. All division faculty members participate in graduate and undergraduate teaching. The number of patients seen and the broad spectrum of complex endocrine disorders make for a rich educational experience for medical students, medical residents, and trainees in endocrinology. So far, 176 clinical endocrine fellows have completed their training at Mayo Clinic. The division also has a National Institutes of Health–supported training grant, which provides 6 postdoctoral endocrine fellows with additional laboratory-based research training.

All divisional members belong to one or more core groups (Box), reflecting their areas of interest and expertise (Figure 1). The goals of these core

Box. Core Groups

- Bone and Mineral
- Diabetes and Metabolism
- Hospital
- Hospital Nutrition
- Lipid
- Outpatient Nutrition
- Pituitary-Gonad-Adrenal
- Thyroid
- Transplant

groups are to 1) identify and critically review new or emerging diagnostic and treatment strategies and, when appropriate, incorporate them into divisional practice; 2) foster, encourage, and coordinate research and education within the faculty's areas of expertise; and 3) monitor the activities of and provide staffing to the corresponding subspecialty clinics.

The leadership of the division is rotated every 8 to 10 years. John C. Morris III, MD, just completed a 10-year term as chair of the division, and William F. Young Jr, MD, has succeeded him in that position (Figure 2). There have been 5 previous chairs of the endocrine division (Figure 3).



Figure 3. Past chairs of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition in a photograph taken in 2004. Standing (from left to right) John C. Morris III, MD (2002-2012); Colum A. Gorman, MB BCh, PhD (1985-1992); B. Lawrence Riggs Jr, MD (1974-1985); and Robert A. Rizza, MD (1992-2002). Seated: William M. McCahey, MD (1967-1974).

Mayo Clinic Endocrine Testing Center

Testing of endocrine gland function is a cornerstone of the practice of endocrinology. *Dynamic endocrine testing* refers to the practice of introducing a provocative or suppressive agent or situation and monitoring the hormonal response. The keys to successful dynamic endocrine testing are standardized protocols, expertise in performing the tests, and reliable laboratory assays. The outpatient Endocrine Testing Center (ETC) for dynamic endocrine testing was formed at Mayo Clinic in 1976. The reasons for creating such a center included standardization of testing protocols, patient safety and convenience, and avoiding hospitalization for complicated testing protocols. In the first year of operation, 607 patients underwent dynamic endocrine testing. Currently, approximately 6,000 tests and procedures are performed annually in the Mayo Clinic ETC.

Dana Erickson, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, Minnesota, has served as the medical director of the ETC for the past 10 years. Todd B. Nippoldt, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Minnesota has recently transitioned into this role. Yvonne A. Krulish, RN, of the Division



Yvonne A. Krulish, RN, and Dana Erickson, MD

of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Minnesota, serves as the nurse supervisor. Dr Erickson explains: "Endocrine testing will always be an integral part of the practice of endocrinology. However, the roles for dynamic endocrine testing have been evolving. Over the past 3 decades, there has been a transition from a reliance on stimulation and suppression testing to highly sensitive trophic and target hormone assays and enhanced imaging techniques. For



Figure. Yvonne A. Krulish, RN, (seated, left) and her staff in Endocrine Testing Center, (standing from left) Leroy E. Johnson Jr, RN, Kendra A. Burshem, Corey L. Schweitzer, RN, and (seated) Kirsten L. McCaleb.

example, advances in laboratory assays (such as thyrotropin [TSH]) made some dynamic tests (such as thyrotropin-releasing hormone [TRH] stimulation test) obsolete. Because the early TSH assays were not very accurate at the lower limits of detection (eg, the lower limit of detection was 1.0 mIU/L), it was impossible to distinguish between low-normal and truly suppressed serum TSH concentrations. The TRH stimulation test in these patients was critical to determine if TSH was truly suppressed. With each new generation of TSH assays, the accuracy at the lower limit of detection improved (the current lower limit of detection is 0.002 mIU/L). In the late 1970s and early 1980s, our ETC performed an average of 600 TRH stimulation tests each year; however, none have been performed since 1996. The current TSH assays very accurately predict the TSH secretory response to TRH administration. Another example of the evolution of endocrine testing is the decreasing reliance on pheochromocytoma provocative testing (eg, glucagon and histamine stimulation tests). The advances in the measurements of fractionated metanephrines and catecholamines in blood and urine samples have made dynamic testing for pheochromocytoma obsolete."

Despite advances in the measurements of trophic and endocrine gland target hormones, the dynamic endocrine testing menu remains robust. Ms Krulish says: "Commonly performed

dynamic endocrine tests include cosyntropin stimulation test to assess adrenocortical cortisol secretion; dexamethasone suppression testing to assess autonomy of cortisol and corticotropin secretion; 1-hour oral glucose challenge testing for gestational diabetes; 3-hour glucose tolerance testing to assess growth hormone secretory autonomy; glucagon stimulation testing for growth hormone deficiency; and insulin-induced hypoglycemia test for assessment of growth hormone and corticotropin secretory capacities." Dr Erickson adds: "The recent lack of availability of growth hormone-releasing hormone and corticotropin-releasing hormone have added challenges to our clinical practice, and alternative provocative tests, such as the glucagon stimulation test for growth hormone, have been put in place. In close collaboration with Mayo Medical Laboratories, the ETC is actively involved in prospective studies to establish accurate diagnostic cutoffs for dynamic endocrine testing using the latest and most precise hormone assays."

Dr Erickson concludes: "As the accuracy of laboratory assays for trophic and target hormones continue to improve, the roles for dynamic endocrine testing will continue to evolve. A complete and up-to-date endocrine testing manual remains key to the accurate performance and interpretation of dynamic endocrine testing."

The Mayo Clinic Dan Abraham Healthy Living Center Part 2: Nutrition Programs

An article in volume 7, issue 1 of *Mayo Clinic Endocrinology Update* highlighted the development of and programs available at the Dan Abraham Healthy Living Center (DAHLC). M. Molly McMahon, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, Minnesota, is a member of the Mayo Clinic Healthy Living Committee and has responsibility for the nutrition practice at the DAHLC. Dr McMahon says: "We are becoming all too familiar with the sobering statistics that two-thirds of American adults and one-third of children and teens are overweight or obese. America spends more than \$150 billion per year on health care linked to obesity and associated comorbidities. Obesity is directly associated with 3 of the 5 most costly illnesses in this country: diabetes mellitus, heart disease, and hypertension.



Katherine A. Zeratsky, RD, LD, and M. Molly McMahon, MD



Figure 1. Timothy Cockram, the executive chef of the Dan Abraham Healthy Living Center cafe.

tive programs in nutrition, activity, and stress management, among other modalities. The work site is 1 sector of the multisector approach needed to attack the public health problem of obesity. Mayo Clinic aspires to have the healthiest workforce in America and also to decrease staff health care costs.” However, the benefits of healthy nutrition reach all and are not limited to overweight and obese persons.

In 1988, the Surgeon General’s Report on Nutrition and Health stated: “For the 2 out of 3 adult Americans who do not smoke and do not drink excessively, one personal choice seems to influence long-term health more than any other—what we eat.” Katherine A. Zeratsky, RD, LD, a member of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Minnesota, explains: “Healthy nutrition is important to prevent disease, to treat disease, and to promote health so each of us can benefit. This premise underlies the philosophy of the nutrition programs of the DAHLC. The nutrition programs include weight management, nutrition education, and culinary skills. The café is the sole spot on our campus where all foods meet the wellness criteria. This

Preventable illnesses account for most health care expenditures, and obesity impacts most preventable diseases. Obesity cost US employers \$73 billion in lost productivity, and 27% of the increase in health spending between 1987 and 2001 was attributable to obesity.”

Dr McMahon continues: “It follows that one of the DAHLC priorities is to offer innova-



Figure 2. Chef Timothy leading a culinary program.

means that staff do not have to read labels for point-of-purchase nutrition information to make a healthy choice, but rather can simply choose from any of the delicious food options.”

Primary care clinicians can refer patients to the DAHLC for comprehensive nutrition education. The DAHLC participants can meet with wellness coaches who identify the best programs for them. The DAHLC staff provide concise feedback to referring clinicians about their patients. Many patients are referred to weight management programs on the basis of interest, body mass index (BMI), health problems, or a combination. A registered dietitian and a wellness coordinator lead group classes, which are scheduled at different times of the workday. These programs are organized on the basis of BMI categories (25-29.9, 30-39.9, and 40-50 kg/m²) and sex. Programs meet twice weekly for 10 to 22 weeks and integrate nutrition, physical activity, group support, and behavior change.

Emphasis on activity, stress management, and behavior modification varies with the programs. Ms Zeratsky highlights: “The nutrition component focuses on hunger awareness, identifying eating triggers, mindful eating, increasing consumption of low-energy-density foods, portion control, creating menus, and

healthy dining out. Average group size is 20, and the classes are offered many times per year. Captured data in the initial pilot include attendance and short-term weight trends. More than 90% of participants complete the program and, on average, participants lose about 5% body weight. Plans include capturing long-term weight data along with medical, emotional, and wellness outcomes. Many participants choose to continue in nutrition classes or in yoga, meditation, stress management, sleep enhancement programs, and aerobic activity, among others.”

Dr McMahon comments: “The culinary program has proved to be very popular. Data show many adults do not have basic cooking skills. The literature reports an association between fast-food consumption and overweight and obesity. One of our goals is to provide knowledge and hands-on experience to allow busy staff to create healthy meals in a reasonable time for themselves and their families. Classes are codirected by a chef and registered dietitian. So while the chef highlights healthy cooking strategies and proper use of tools, registered dietitians provide nutrition information and answer questions. Participants complete surveys before and after the class.”

Diabetes Intensive Training Program for Nurse Practitioners and Physician Assistants

The Mayo School of Health Sciences (MSHS) offers a 5-credit professional enhancement course called the Diabetes Intensive Training Program, which is geared toward nurse practitioners and physician assistants. This program includes components of both a Web-based didactic education and a practice-based clinical implementation.

Amy J. Koenigs, RN, CNP, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Rochester, Minnesota, says: “The didactic material for the program was developed using the American Diabetes Association Clinical Guidelines and the reference list provided by the American Association of Diabetes Educators for the Board Certified–Advanced Diabetes Management (BC-ADM) exam. The potential benefits in becoming an advanced diabetes manager include health care cost containment and provision of quality care, along with reimbursement for counseling people with diabetes. At the completion of the course, program participants will demonstrate understanding of diabetes prevention, diagnosis, treatment, management, and comorbidities; be prepared to implement the latest diabetes management recommendations, improve health care costs, increase patient satisfaction, and meet reimbursement criteria; and be better prepared to sit for the BC-ADM exam.”

Ms Koenigs notes: “Once appointed to the course, the online modules can be completed at any time before arriving for the clinical hours.” Inpatient clinical rotation hours are held at Saint Marys Hospital, a 1,265-bed facility that was founded in 1889, within a 2-week period to focus on continuity and intensity in learning. Included in the inpatient experience is an overview of diabetes; complications and management issues, including hypoglycemia and uncontrolled hyperglycemia; and the use of intravenous insulin, corticosteroids, tube feeding, and parenteral nutrition. The outpatient clinical rotation is at Mayo Clinic in the endocrinology division and is scheduled as 10-hour days for a total of 8 days and can be spread out to allow flexibility in maintaining existing practice calendars.

Adrian Vella, MD, of the Division of Endocrinology, Diabetes, Metabolism, and Nutrition at Mayo Clinic in Minnesota, serves as the medical director for the program. Dr Vella comments on the added value of the Diabetes Intensive Training Program: “The intent of the program is to provide a structured theoretical and practical foundation of advanced diabetes care for nurse practitioners and physician assistants, regard-

less of their prior experience with or exposure to patients with diabetes.” Each year, MSHS has the capacity to admit 22 students to its Diabetes Intensive Training Program, with no more than 2 students at a given time. This ensures that students receive close one-on-one instruction and a comprehensive educational experience. Faculty members are chosen for their commitment to teaching, as well as clinical practice or research or both. Many in the faculty have published and lectured extensively and are highly regarded in their field. As MSHS students, participants are encouraged to learn from these valuable resources by attending all conferences, lectures, and seminars prepared for students, residents, fellows, and consulting staff.

Michele P. Denial, NP, a past participant from Wisconsin, states: “Thank you for guiding me to my current state of confidence in caring for patients with diabetes. I have learned a more



Amy J. Koenigs, RN, CNP, and Adrian Vella, MD

organized approach to my diabetes history and physical exam. This experience has helped me to partner in the area to provide a community outreach program for patients with diabetes and their families this year.”

To be eligible to apply for the Diabetes Intensive Training Program, applicants must have a current license to practice without restrictions as a nurse practitioner or physician assistant. Applicants are selected on the basis of their grades, work and volunteer experiences, leadership qualities, and representation of personal qualities and skills in a personal letter. Additional information on the program and details about application can be found at www.mayo.edu/mshs/diabetes-int-rch.html or by contacting Ms Koenigs at koenigs.amy@mayo.edu.

Mayo Clinic Endocrinology Update

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12th Annual Mayo Clinic Nutrition and Wellness in Health and Disease

September 20-21, 2012, Scottsdale, Arizona

Nutrition, physical activity, and other healthy lifestyle behaviors are vital components in the promotion of health and the treatment of disease. This course—designed for physicians, advanced practice clinicians, dietitians, nurses, and health and wellness staff—will provide a full-spectrum, in-depth overview of situations that clinicians encounter in the ambulatory setting, including obesity, obesity-associated medical conditions, effective ways to provide coaching, nutrition for selected groups (pregnant women, elderly persons, patients with diabetes or after transplantation, malnourished persons, and athletes), in addition to physical activity and wellness. Current clinical topics will be highlighted through presentations, interactive case studies, and panel discussions. The course will be held at the Westin Kierland Resort & Spa, Scottsdale, Arizona. For more information about this course, please call 800-323-2688 or visit www.mayo.edu/cme/endocrinology.

16th Mayo Clinic Endocrine Course

January 29-February 2, 2013, Marco Island, Florida

Designed for endocrinologists and interested internists and surgeons, the 16th Mayo Clinic Endocrine Course will address gaps in medical knowledge and barriers in clinical practice, in order to improve the outcomes of patients with endocrine and metabolic disorders. This 3 and 1/2-day course will span the full spectrum of endocrinology through lectures, debates, panel discussions, clinicopathologic sessions, “clinical pearls” sessions, informal breakfast roundtable discussions, and small-group discussions with experts. There will be plenty of opportunity for interaction with the course faculty, who are selected from Mayo Clinic for their expertise and clinical acumen. An optional thyroid ultrasonography course will also be offered. For more information about this course, please call 800-323-2688 or visit www.mayo.edu/cme/endocrinology.



Daniel J. Rader, MD, Chief, Division of Translational Medicine and Human Genetics, Department of Medicine, Perelman School of Medicine at the University of Pennsylvania, presented the 2012 William L. Isley Lecture at Mayo Clinic in Rochester, Minnesota, in May 2012. Dr Rader (left) is pictured with John M. Miles, MD.

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MC5810-0612